Technical University of Liberec
Faculty of Economics

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Liberec Economic Forum 2013

16th – 17th September 2013
Sychrov, Czech Republic, EU

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Barriers for Successful ICT Deployment in Czech Hospitals

Abstract

Information and communication technologies (ICT) play an essential role in supporting daily life in today's digital society. They are used everywhere and play an important role also in delivery of better and efficient healthcare services. The health care is currently not only in Czech Republic one of the biggest "challenges" for advanced information and communication technology. Some of the main problems (ineffective use of some kinds of technological equipment, useless frequency of diagnostic tests, prescription of drugs often without knowledge of other drugs used by the same patient, several times visits of some patients to verify diagnosis) can be solved by sharing data and integrated information. The goal of this article is to find the main barriers of successful ICT deployment in hospitals in Czech Republic. The qualitative research of information systems management and technologies was realized in three hospitals. This research was realized during one year (2012) by the structure questionnaire and interviews with IT managers, human resource officers, research and design (R&D) managers and other management staff. The results confirm increasing use of information and communication technology in health care sector especially in infrastructure, security and in education of staff. This is related to increasing requirement of financial resources and it is the biggest problem in all Czech hospitals. These increasing financial needs are in the conflict with political opinion and with the effort to keep health care free of charge especially in election years. Article also brings results of the secondary research which was oriented towards use of process management systems in Czech hospitals. These software tools can help to solve the biggest problems with lack of financial funds and to manage the effective and efficient hospital processes and ICT services.

Key Words

information and communication technology, information systems, health care, process management

JEL Classification: I10, C89

Introduction

Management of medical services is currently associated with a challenge to lead an institution with a relatively large number of employees, complying with the statutory requirements of the Health Ministry and of insurance companies. Management also has to deal with significant quantities of various medical equipment, is influenced by the ethical requirements and very limited financial resources. Furthermore there are a number of other requirements and restrictions that must be observed. Therefore the

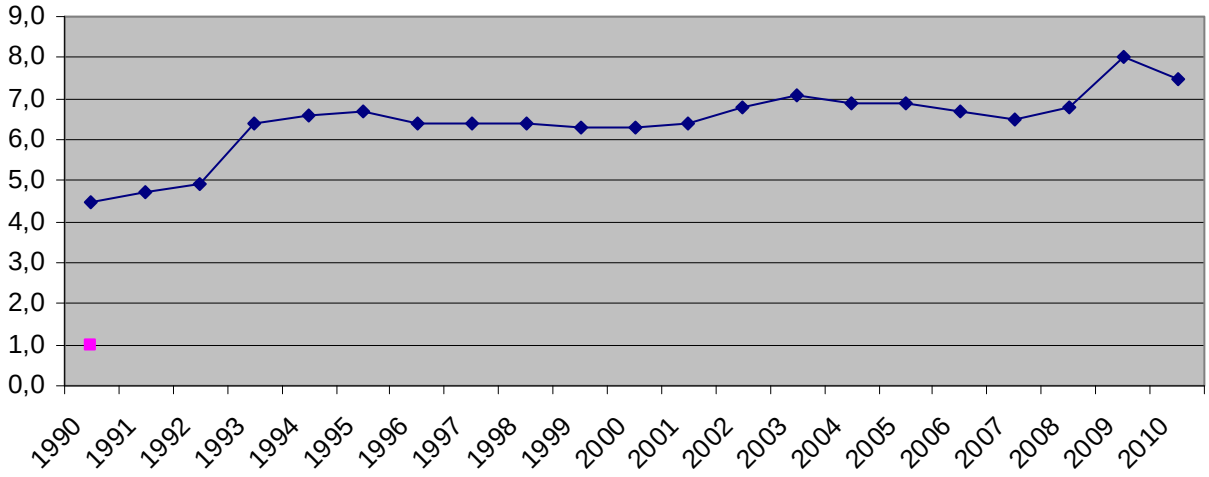
hospital management depends on good information systems and information technology.

The basic modules of information systems (IS) needed for health care industry are almost the same as in other business areas. They include all economic modules necessary for the operation of hospitals and therefore enable consistent economic data entry without a need to duplicate the inputs. More sophisticated information systems have advanced modules for the needs of healthcare facilities that are required for system integration and operation of medical departments. Such modules have options for editing and reading data (medical card), maintenance of medical devices, and fault reporting requirements, registration of medical devices, property records and reading bar code on drugs. Using of more sophisticated information systems enables to implement systemic approach to management in healthcare facilities. But still the management has the following key questions:

- How to improve the internal and external processes?
- How to assess the processes?
- How the processes could be more flexible?
- How to simulate the processes?
- How to be prepared for a crisis or unexpected situation?

In Czech Republic health care expenditure were increasing continuously every year till 2009 (see figure 1). Since 2010 the expenditures have descended. Therefore the hospital mangers started to put emphasis on efficiency and savings.

Fig. 1 Total expenditure on health % GDP in Czech Republic



Source: Czech Statistical Office [19]

Many studies have been carried out in various aspects of ICT health. When looking at types of barriers for hospital ICT adoption, most of the studies aimed to identify all relevant barriers as:

- Organizational management barriers [8, 9],
- ICT skills [13],

- Team work and cooperation [14, 3],
- Face-to-face interaction versus new ways of working [7, 8],
- People policies [3, 9],
- Changes in work processes and routines [2].

1. Background of the research and methodology

This article brings results of the survey which is part of big international project: "An Evaluation of the Management of the Information Systems (IS) and Information Technologies (IT) in Hospitals" This project (http://www.cti.gov.br/projeto-gesiti.html, GESITI/Hospitals) was established in the Center for Information Technology Renato Archer in Brazil by the Coordinator of the research José Antonio Balloni [5] who is the author of the questionnaire. In this large project team we can find the members from the whole world including the Czech Republic.

The questionnaire [5] is copyrighted of the Center for Information Technology Renato Archer (CTI), located at Campinas/SP/Br, a unit of the Ministry of Science, Technology and Innovation (MCTI) and, the Cooperation Agreement has been signed between Faculty of Economics, Technical University of Liberec. More than 200 open and closed questions are divided into several strategic areas:

- Human resources,
- Strategic management,
- Research and Development and Technological innovation,
- Competitiveness of Hospitals and their cooperation for a strategic advantage,
- Information technology availability,
- E-Business,
- Telemedicine,
- Approach to clients,
- Quick prototyping of health and
- Waste management in a Health-care.

This questionnaire has been updated since 2004 by the GESITI Project. The methodology is fully described in reference [1, 5]. During the year 2012 the questionnaire has been distributed in three hospitals in Czech Republic, where the high managers from human recourse, ICT, R&D, strategic planning and other departments (as procurement, waste management) fulfilled the questions. Detailed results of the questionnaire are described in report An Evaluation of the Information Systems Management and Technologies in Hospitals: The Region of the Technical University of Liberec, Czech Republic, [1]. This report brings the complex overview of ICT in these three hospitals. One of the main questions of this research is: “are there some big differences in ICT barriers among the hospitals in capital and bigger city and the hospital in smaller town in ICT use”? The second question is: What are the barriers of ICT deployment in all hospitals? The first hospital is located in smaller town (17 thousands of inhabitants), has 281 beds, 582 employees, the second hospital is from bigger town

(100 thousands of inhabitants), has 957 beds, 1100 employees, the third one is from the Czech capital (1 million of inhabitants), has 970 beds and 2351 employees. All three hospitals are state contributory organisations. None of three hospitals operates in foreign countries.

2. Barriers of ICT Deployment

All main areas of answers in questionnaire (each area had approximately 10 – 20 detailed questions) in analyzed hospitals have been summarized in the next table. Some of the answers were identical, some of them very similar and some were totally different. For example – question: "Level of client importance within a process of strategy creation" could be: Low, Middle, High. When the answer was Low and High – that was considered as different answers, when the answer was Middle and High – that was considered as similar. We can see that a lot of areas of answers were very often similar or identical.

Tab. 1 Similarity of the answers in hospitals

Areas of questions		**Identical answers**	**Similar answers**	**Total different answers**
1	Human resources		+	
2	Strategic management of a medical institution	+		
3	Research and development		+	
4	Technological innovation investments		+	
5	Cooperation for innovation		+	
6	Competitiveness of hospital & Cooperation for strategic advantage		+	
7	Information technology availability in medical institution		+	
8	Acquisition of equipment and facilities		+	
9	Application programs		+	
10	Databases	+		
11	Outsourcing		+	
12	Network, security and telecommunications		+	
13	IT management		+	
14	E-commerce (buying products and services)	+		
15	General information about ICT	+		
16	Use of the Internet	+		
17	ICT Management		+	
18	E-commerce (selling services)	+		
19	Costs/Expenditures of implemented system	+		
20	Barriers in use of the Internet and E-commerce	+		
21	Telemedicine		+	
22	Approach to clients e-Health	+		
23	Quick prototyping of health	+		
24	Waste management in a health-care	+		
	Total	**11**	**13**	**0**

Source: Own

Similarity of the answers was compared with the statistic test χ^2 chi-square (see tab. 2).

Tab. 2 Contingency table

Questions	Yes	No
Identical	11	0
Similar	13	0
Different	0	24
Total	24	24

Source: Own

Null hypothesis (H_0) has been formulated: The answers of the questions are different in analyzed hospitals. H_1 negating hypothesis H_0 was also determined (The answers are not different in analyzed hospitals).

$$G > \chi^2_{1-\alpha}\left[(r-1)(s-1)\right] \tag{1}$$

If the tested criterion value is greater than $100(1-\alpha)$ % – division quintile χ^2 with $(r-1)(s-1)$ degrees of freedom, with $\alpha =$ the level of significance (most frequently used 5 %), with r = number of rows and s = number of columns.

$$G = \sum_{i=1}^{r}\sum_{j=1}^{s}\frac{\left(n_{i,j} - n'_{i,j}\right)^2}{n'_{i,j}} \tag{2}$$

The dependences of variables are measured according to the above-specified formula. If the dependence of the monitored and hypothetical variables are small, the differences are minor.

If $G > \chi^2_{0.95}$, zero hypothesis H_0 can be rejected.

Tab. 3 Results of χ^2 test

G	48
χ^2	5.91
Contingency coefficient (CP)	0.64
Cramer coefficient(CCR)	0.84

Source: Own

Table 3 specifies the results of calculation according to statistic application Statgraphics. CP and CC must be from interval (0.1). Considering the fact that value $G > \chi^2_{0.95}$ (48>5.99), and both coefficients (Cramer and Contingency) show a strong dependency, hypothesis H_0 can be rejected, thus proving hypothesis H_1. The ICT use do not depends on the size of the hospital and the level of ICT is almost the same (answers of the questions are not different).

The biggest barrier of ICT deployment is lack of finance and it does not depend on the size of hospital. How to manage this barrier? How and where to find the financial reserves? One of the ways is to use ICT-based management tools. These tools can help to promote more efficient processes also in ICT departments. Business process

management tools can also allow not just more effective monitoring of the performance but also the simulation of processes. Therefore the second following research was oriented towards using of process management tools.

3. Successful ICT deployment

During the last decades the process management has been applied in many business or production enterprises but still Garner Group [21] expects that business process management (BPM) will grow. Gartner research identifies business process analysis as an important aspect and not just in manufacturing industry but also in services and health care services. Structural changes and the ability to be able to react on in routine work and also on the emergency or different unexpected situations in the health care sector intensify the need of simulation and process optimization [4]. The hospitals and health care centers are the new emerging areas. They are very important elements also in the crisis situations and therefore we have focused our research on the health care services and ICT use [6].

Business Product Management (the BPM) tools are appropriate solution in this kind of situations, because they allow high-quality analysis elaboration and – as a side effect – give valuable information to management of the organization. Additionally these tools can help to simulate the different changes during emergency and disasters. Some of these software tools are free:

- Adonid Modeler,
- BizAgi Process Modeler,
- Questetra BPM Suite,
- Tibco Business Studio,
- Aris Express,
- Process Maker,
- Open ModelSphere,
- Visual Paradigm – Smart Development Environment (Community Edition),
- Visual Paradigm for UML – Unified Modeling Language (Community Edition).

Information about processes is in information systems [11]. These records monitor different types of events that occur during process execution, including about start and completion time of each activity, its input and output data, the resource that executed it. Also any failure that occurred during activity or process execution is recorded. Data in warehouses are cleaned, aggregating and analyzing by with Business Intelligence technologies. It is very important that with these tools and methods it is possible to explain why for instance low-quality executions occurred in the past and to predict potential problems in running processes or to predict some exceptional situations.

3.1 Data collection and results of process management survey

The next step of the research was focused on a narrow group of ICT tools, which are designed for the managing and modeling process in hospital facilities. These tools can be used by the management and medical staff as a sophisticated auxiliary tool. The research aims to identify the satisfaction with the currently used ICT tools, in various medical facilities throughout the Czech Republic.

Data of the survey were collected through a structured questionnaire in 40 hospitals. The questionnaire was distributed in spring 2012 to determine the use of information systems in hospitals and using them as a tool for process management. Questionnaire had 20 questions as: how the organization strategy is creating, orientation to process management, which ICT tools are used for process management, using of new ICT technology, research and development etc. One of the most important questions in questionnaire, which caused further research in this area, was: using of process modeling tools. This question emerged from previous research realized in year 2011 and the issue is mainly associated with the individual management methods of hospitals [2, 3]. Especially in the health care there is a problem with the need of implementation the specific modeling supported by ICT [3].

Results of this second survey confirm very low use of ICT tools in process management (just 26 % hospitals use ICT tools in process management), 79 % of hospitals have financial problems with ICT costs (it confirms the results from the first survey), only 20 % measure the process effectiveness, 40 % hospitals think about some innovation in ICT and realize some radical changes in ICT process.

4. Conclusion

Health care industry should be one of the most information intensive and technologically advanced in our society. In Czech Republic the expanses were 290 billions Czech Crowns in 2011. It is less then in last years because of economic crisis. The research confirms that the biggest problems in all three hospitals are financial resources.

From the first questionnaire we can see that there are not big differences between the analyzed hospitals in relation with the size of hospital and the town where the hospital is situated. All analyzed hospitals use ICT for the communication, storage the patients´ data and financial applications. All hospitals educate their employees; have the main strategic plans which are known to management but not to the low operational levels. They use SWOT analyze, Balanced Scorecard Method [10] and benchmarking for creating of the organization strategy. The strategic plans are designed for 2 years. An important element of organization strategy creation is a client. The client (patient) is in the centre of attention if hospital intends to improve its competitiveness.

Second survey also confirmed that the hospitals do not manage their processes effectively and are not using ICT tools for process management. The main advantages of these tools are in better services to patients, better resource planning, increasing of

service quality and better cooperation in research and sharing of knowledge. Structural changes and the ability to be able to react especially to the emergency and different disasters in the health care sector intensify the need of simulation and process optimization.

Still many other questions remain and it will be necessary to identify truly effective applications for the health care sector and the user base. How will future ICT solutions be deployed? What forms of user interface will be most effective? How will future ICT systems link to existing systems and existing healthcare practices? These are some of the questions that need to be addressed further in order to ensure a productive collaboration between industry and the healthcare sector in developing future ICT solutions in hospitals.

Research and development activities in hospitals, especially those linked to the ICT, are related to many changes in their processes and organisation. Dynamic development of external environment of hospitals leads to a higher saturation of ICT applications and often to a generation exchange. At presence, the attention is focused on more efficient resource utilization and hospitals´ growth and expansion than on ICT capacity expansion. Current competitive environment requires high quality management systems and, consequently, from the point of view of data reception, elaborating and storage, high quality information systems. Therefore the European Union supports projects oriented towards new technologies in agenda A2020 vision [20].

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Counter Competitive Intelligence Cycle

Abstract

The author's position is based on the well-known experience of Competitive Intelligence units that the classical cycle of Competitive Intelligence (management, collection, analysis and distribution) does not suit the defensive posture of Counter Competitive Intelligence. The reason why the offensive cycle of Competitive Intelligence does not fit Counter Competitive Intelligence is the fact that Counter Competitive Intelligence faces completely different tasks and therefore engages in different activities. Regrettably, professional literature dealing with the issues of Counter Competitive Intelligence touches upon this problem only marginally.

In this article, the author first defines the so-called "Basic Cycle of Counter Competitive Intelligence". He then proceeds to fill this basic cycle with all the essential activities that it should contain. The activities in the basic Counter Competitive Intelligence cycle are as follows: 1. Assignment. 2. Problem formulation and analysis. 3. Planning how to solve the problem. 4. Sourcing of data and information, including security measures. 5. Collecting essential data and information. 6. Processing collected data. 7. Information analysis. 8. Securing evidence. 9. Active intervention. 10. Evaluation and lessons learned. 11. Proposed measures. The author then outlines the appropriate content of activities in this basic Counter Competitive Intelligence cycle.

The article concludes with the individual activities of the basic Counter Competitive Intelligence cycle organized into the following 5-phase model of "Counter Competitive Intelligence Cycle": I. Planning and direction. II. Data collection. III. Analysis. IV. Action. V. Measures.

Key Words

competitive intelligence, counter competitive intelligence, intelligence cycle

JEL Classification: D80, G14, M15

Introduction

Any company with a position of prominence in a challenging market supports its strategic decision-making by gathering intelligence. This work is done by a Competitive Intelligence unit, see Bartes [1]. J. D. Rockefeller [11] expressed an opinion that "*the next best thing to knowing all about your own business is to know all about the other fellow's business*". In corporate practice, this means that success of an enterprise is always preceded by effective intelligence work, and failure is the consequence of either lack of intelligence or poor defensive performance of that unit. Counter Competitive Intelligence (CCI), being the defensive portion of the corporate Competitive Intelligence unit, then becomes very important. CCI's main task is to prevent the other participants in a competitive clash from obtaining our confidential information, especially the

information about the basis of our organizational system or our competitive advantage. American Society for Industrial Security (ASIS) cites the following four main consequences of not having a counterintelligence program [10]:

1. "Loss of competitive advantage.
2. Loss of market share.
3. Higher costs of research and development.
4. Increase in insurance premiums".

The intent of this article is to suggest potentially better approaches and/or conditions to attain a higher level of counterintelligence protection for a company in unforgiving competitive environment. This article was written using the methods of observation, analysis, synthesis, comparison and deduction.

1. Results

A survey of available literature about the work and procedures used by Competitive Intelligence personnel in safeguarding commercial secrets of corporations indicates that, aside from defining some rudimentary aspects of this type of protection, there is no routine or standard methodology. This is exemplified by publications authored by Fuld [5], Kahaner [6], Liebowitz [8], and particularly Carr [4], who describes the practices of 15 leading experts on Competitive Intelligence in the United States.

Our concept in protecting corporate trade secrets starts with a premise that such protection must be conceived as a unified system. Each of its subsystems listed below is equally important in protecting the company's trade secrets. It should be noted that the effectiveness of the whole system is determined by the strength of its weakest link, see Beranová, Martinovičová [3]. An overview of these subsystems is provided in Table 1.

Tab. 1 Subsystems ensuring protection of corporate trade secrets

Name		Activity Description
1.	**Organizational**	a) Decision WHAT to keep secret and WHY. b) Categorization of buildings and structures. c) Monitoring the compliance with Trade Secret Protection Directive. d) Preparation of Company Security Policy.
2.	**Legal**	a) Legal protection of corporate intellectual property. b) Preparation of Trade Secret Protection Directive. c) Employment contracts with employees potentially exposed to company's trade secrets.
3.	**Personal**	a) Selection of employees potentially exposed to company's trade secrets. b) Periodic personnel training.
4.	**Physical**	a) Guarding of buildings, structures, etc. with human involvement. b) Mechanical security of those buildings and structures. c) Electronic security of buildings and structures.
5.	**Specific**	Company's counterintelligence protection

Source: prepared by author

To facilitate the management of activities implicit in these subsystems, they can be organized into the following three higher subsystems, namely:

1. Company security policy.
2. Company security protection.
3. Company counterintelligence protection.

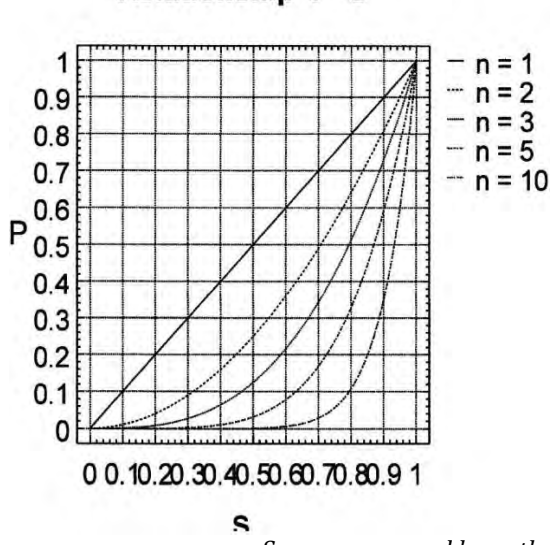
Given the intent of this article, it will discuss only the corporate counterintelligence protection with its fundamental objective to detect, in a timely manner, an intelligence breach or an industrial espionage attack, and to prevent a loss of classified information. Webster's New Collegiate Dictionary defines the leakage of information as *"information that has become known despite efforts at concealment".* The likelihood that information will be disclosed increases significantly with each individual carrier of that information. For these purposes, the following relationship can be derived from the probability theory:

$$P = s^n \tag{1}$$

where: P – probability that a given information will remain secret, s – reliability that the information will not be divulged by its carrier, n – number of information carriers.

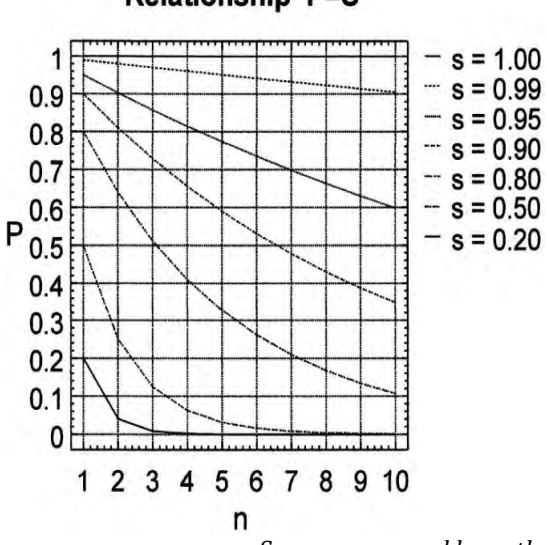
For simplicity, the above formula assumes the same reliability s for all information carriers. Plotting the probability P that given information will remain confidential due to reliability s of the information carrier for a varying number of information carriers produces diagram $P=P_{(s)}$ shown in Fig. 1. A graphic representation of the probability P that a certain information will remain confidential with n information carriers having different levels of reliability s is the function $P=P_{(n)}$ shown in Fig. 2.

Fig. 1 Graph of function $P=P_{(s)}$



Source: prepared by author

Fig. 2 Graph of function $P=P_{(n)}$



Source: prepared by author

These figures clearly show a sharp decline of probability that the information will be kept secret as a function of both the number of information carriers and their reliability. They indicate that the information is "*relatively safe*" when known to *only two* very reliable employees. The weakest link in the security of commercial trade secrets has been, is, and will always be, the human factor. Consequently, company employees, both current and former, represent the main risk. This issue was examined by Fuld [5], who offers his own formula for information leaks (see Table 2).

Tab. 2 Practical Application of the Information Leak Formula

Logic	Example	Rationale
Total number of employees.	60,000	Take into account all employees as each of them is in contact with the outside world.
25 % of the employees have frequent contacts.	15,000	A conservative estimate of those employees (in %) in frequent contact with their surroundings.
In a normal working day, each member of the 25 % group makes 5 telephone calls.	75,000 potential meetings or phone calls.	It resents a variety of opportunities when a leak may occur during a conversation
Assumption: only 1 % of these phone calls involve an active harmful information.	750 potentially damaging phone calls in one day.	Some leaks have an immediate effect on the company, others a delayed effect as a time bomb.
The number of leaks in a year with 250 working days.	187,500 potentially damaging leaks per year.	Assumption: no leak crossing.

Source: Fuld [5], modified by author

Based on the above, we can now define the concept of corporate counterintelligence protection as a "*specific corporate activity focusing on identification, detection and subsequent prevention of negative actions intending to uncover (steal) or otherwise compromise the trade secrets of our company. The effort has to be directed against the actions of our competitors as well as the negative actions of our own employees*", see Bartes [2]. Our basic precept in solving a given problem is the assumption that company's counterintelligence protection falls under intelligence services rather than corporate security. According to DeGenaro [11], this activity may be characterized as follows:

1. "Identification of critical information and activities.
2. Threat analysis.
3. Vulnerability analysis.
4. Risk assessment.
5. Selection of adequate countermeasures."

From the corporate practice of Competitive Intelligence units, it is obvious that even their defensive work can benefit from standardizing repetitive activities in a definite, periodically repeatable system. Such a system can be an intelligence cycle model that encompasses all basic activities which, in our opinion, a Counter Competitive Intelligence cycle should have. Table 3 provides a summary of these activities, under the tentative heading of Basic Counter Competitive Intelligence Cycle.

Tab. 3 Basic Counter Competitive Intelligence Cycle

No.	**Name of Activity**
1.	Assignment
2.	Problem formulation and analysis
3.	Planning how to solve the problem.
4.	Sourcing of data and information, including security measures
5.	Collecting essential data and information
6.	Processing collected data
7.	Information analysis
8.	Securing evidence
9.	Active intervention
10.	Evaluation and lessons learned
11.	Proposed measure

Source: prepared by author

The content of the individual activities listed in Table 3 is defined below.

1. Assignment

Among the defensive activities of Competitive Intelligence is the task of early recognition (identification) of an interest (attack), or even attempted industrial espionage, on our company by a Competitive Intelligence unit of another firm. It is therefore necessary to divide this initial activity of the basic Counter Competitive Intelligence cycle into two distinct functions:

1. **Internal function:** This function must begin with a decision of top corporate management to define the items that constitute the substance of trade secrets per par. 17-20 of commercial law. The Counter Competitive Intelligence has to respond by checking the function of the existing company system with regard to trade secret protection. Proposed at this point should be the different classification levels (WHO, WHAT, HOW, etc.), the information storage system, materials, as well as products and their record of manipulation (who, what, when, where, how, what, why). It is important to establish a feedback to know how the prerogatives and obligations are being carried out in the workplace. It is further necessary to define how the system functions, in its entirety and in each organizational element. These initial activities should also include an analysis of the system, its continual monitoring, and its development over time. The system must be fine-tuned to ensure that all occurrences deviating from the system's established norm are identified.
2. **External function:** The task of this external function is to give an early signal that the activities within the sphere of our corporate operations are being restricted, or the achievement of our strategic objectives threatened, or that an attempt has been made to compromise the ownership of our trade secrets. Sales Department, for example, must be able to define, in the external environment where it operates, what constitutes a disruption of our normal system functionality (see the description of internal functions). The same is true for other professional groups (relative to the external environment of our company, e.g. see Kocmanová, Dočekalová [7]).

2. Problem analysis and formulation

Should these internal and external signals be identified, the Counter Competitive Intelligence unit must be able to:

1. determine (find out) WHO, WHAT, HOW etc.
2. ascertain how the competing company works (in principle) and verify that its activities in our sphere of interest have nothing to do with breaches of discipline by our employees. The conclusion might be that it deploys very sophisticated methods of Competitive Intelligence, or conversely that it does not even have a CI unit and the result of its activity is corresponds to its creative potential, etc.

On the basis of this analysis, we can articulate our problem as follows:

1. our own system is failing (there are leaks of classified information, or the system produces symptoms that are readily identifiable and readable by the Competitive Intelligence unit of a competing firm),
2. external environment (a competing firm) is getting the upper hand and wants to take a greater advantage of the competitive space that the situation offers.

3. Planning how to solve the problem

The crux of the problem lies in the fact that functionality of our system is in jeopardy. Now the situation has to be assessed from an economic as well as personal viewpoint, in the following manner:

1. I have to re-evaluate the internal company system with regard to its own function and its level of trade secret protection.
2. Based on the internal system changes, it is necessary to institute appropriate changes and security measures in the external system of trade secret protection.

4. Sourcing of data and information, including security measures

We must establish a new organizational structure and function in the company, re-evaluate the scope of protected information in all its sections, impose new restrictions on the sharing of classified information. It is necessary to designate what needs to be "watched" at individual workstations. The system has to be set up so that we know that what was instituted is being followed. It is in essence a system of reports and means of monitoring the system to ascertain that the new system functions as required.

5. Collecting essential data and information

From the perspective of a new organizational structure, we need to establish what tasks will the employees perform and what will be the outputs. These outputs, in a suitable form, will be submitted to the Counter Competitive Intelligence unit.

6. Processing the collected data

A system configured as described generates a large amount of information from both the internal and the external function. This information can be categorized as

1. official information – coming from a function of corporate system
2. specific information – coming from specific sources.

7. Information analysis

All processed information must be analyzed. The output should be usable information, i.e. intelligence. The activity should conclude with an assessment how serious are the established facts. It is also necessary to evaluate the resources and methods that Competitive Intelligence units of competing companies used in their offensive.

8. Securing evidence

The collected evidence should match the gravity of the detected actions. Taking into account the preceding analysis, it is necessary to determine whether some of the collected and analyzed reports could serve as evidence.

9. Active intervention

The purpose of an intervention is to prevent a negative activity, or at least put a stop to it. The nature of an active intervention depends on the specific pieces of evidence that can be used. One has to consider WHAT, HOW, and TO WHAT EXTENT is an item useable. If at least some are usable, it is possible to deal with such a conduct officially. However, if an official use of the evidence is undesirable due to source protection concerns, then it is necessary to take appropriate organizational measures so that the negative activities would not continue.

10. Evaluation and lessons learned

Every concrete action should be followed by an assessment how effectively our system works. WHAT needs improvement, WHAT was done well, WHAT works as expected, WHAT should be altered, etc. Concrete action refers to cases identified by an alert that the system function was somehow compromised plus the cases uncovered during the regular checks performed to verify the activity level of our system.

11. Measures proposed

The evaluation performed in No. 10, should be put on the company project list and implemented in the shortest possible time.

2. Discussion

The foregoing activities of the Basic Counter Competitive Intelligence can be grouped by their linkage and similarity into the following five phases of the Counter Competitive Intelligence Cycle, see Table 4.

Tab. 4 Counter Competitive Intelligence Cycle

Phase of CCI Cycle		Activities of the Basic CCI Cycle
I.	Planning and direction	Contains activities 1; 2 and 3
II.	Data collection	Contains activities 4 and 5
III	Analysis	Contains activities 6; 7 and 8
IV	Action	Contains activity 9
V.	Measures	Contains activities 10 and 11

Source: prepared by author

As a practical matter, a Counter Competitive Intelligence unit can organize the above activities of the Basic CCI Cycle around the habits, possibilities, or abilities into a four-phase Counter Competitive Intelligence Cycle model. In that case, the phases of Data Collection and Analysis merge into one.

The five-phase model of the Counter Competitive Intelligence cycle described above was implemented in four companies. The introduction of this model took, on average, a period of three months. The implementation required the addition of one person to Competitive Intelligence. The results began to show in the next 4 – 6 months after putting the CCI model into practice. During that time, it was already possible to collect and analyze much information about the competition trying to acquire certain parts of trade secrets in those companies. Thereafter, it was possible to evaluate specific intelligence attacks of rival companies and, on this basis, adopt appropriate countermeasures. These countermeasures greatly enhanced the effective protection of our corporate trade secrets.

Conclusion

A well known fact, born out by many practical cases, is that the harder the competitive struggle in tough markets, the more ideas are stolen. We should keep in mind that this domain called "industrial espionage" cannot be totally eradicated since competition cannot be expunged in market economy nor egalitarian conditions imposed on all players in the economic arena by taking away the trade secrets of corporations. This means that as long as there are trade secrets helping the company achieve better economic results in the marketplace, the phenomenon of industrial espionage is bound to exist!

In the current corporate practice, the existence of industrial espionage is complemented by a perfectly legal and highly sophisticated endeavor of Competitive Intelligence units of competing companies. Our businesses need to learn how to defend themselves against that activity, too, because according to [11]: *"an attacker may be able to hide part*

of its actions all the time, or all of its actions part of the time, but it can never conceal all of its actions all the time".

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Global Competitiveness of Developed Market Economies and Its Relation to Dimensions of Globalization

Abstract

Globalization is often understood as increasing global economic integration, global forms of governance, globally inter-linked social and environmental development. The aim of this article is to map, analyze and evaluate, by the means of statistical analysis, the mutual relationships between three dimensions of globalization (economic, social and political) and the global competitiveness of developed market economies. The developed market economies are 35 countries with the highest values of the composite Human Development Index (HDI). The first part provides the methodology of measure overall globalization using the composite Index of Globalization KOF 2011. The second part introduces the way of measuring competitiveness – the Global Competitiveness Index 2011, its methodology and results. The third part compares indices and scores together, analyzes them, and confirms or refutes the empirical relationships between the Index of Globalization and its dimensions and the Global Competitiveness Index. It is possible to conclude from the results achieved in the study that globalization remains primarily a very strong and powerful economic phenomenon: more globalized countries are more developed. A statistically significant association between globalization and global competitiveness was demonstrated but in the case of the most developed countries the possibilities of globalization to promote their competitiveness seems to be exhausted. There are weak links between social globalization and political globalization and global competitiveness in the developed market countries. The economic dimension of globalization is not statistically significantly correlated with global competitiveness in the developed market economies. For developed market economies with a high degree of engagement in international relations, technological and innovative processes are possibilities to increase their global competitiveness.

Key Words

Developed countries, Global Competitiveness Index GCI, KOF Globalization Index, economic globalization, social globalization, political globalization.

JEL Classification: F60, F63, O11

Introduction

Increased global economic integration, global forms of governance, globally interconnected and interdependent social and environmental developments are often referred to as "globalization". During the last two decades, political relations, social networks, movement of labor, and institutional change have become more and more involved. As the globalization advances, countries and regions are challenged to shape

more flexible arrangements to ensure that the new risk are dealt with and the new opportunities are exploited. [4] Globalization measures or indices have been employed to intermediate an insight into the investment climate, the current developments of growth, and for understanding the international business environment as well as providing a world perspective that the policy initiatives will be operational within.

The main hypothesis of this paper is that a higher level of globalization increases global economic competitiveness in the developed countries. The aim of this article is to identify and assess the relationship between two factors – global competitiveness and globalization. At the beginning the methodology of measuring globalization and global competitiveness will be introduced. The back-bone of the article consists of verifying and testing the strength of mutual relationships between three dimensions of globalization (economic, social and political) and the global competitiveness. The paper will show the results for a selected sample of countries (developed economies), analyze it, and confirm or reject the hypothesis about the significant linkages of globalization and competitiveness.

1. Measuring of globalization

The **KOF Globalization Index** produced by the KOF Swiss Economic Institute was first published in 2002. "Globalization is conceptualized as the process of creating networks among actors at multi-continental distances, mediated through a variety if flows including people, information and ideas, capital and goods. It is a process that erodes national boundaries, integrates national economies, cultures, technologies, governance and produces complex relations of mutual interdependence." [2, p. 517] The overall index covers the economic, social, and political dimensions of globalization. [3] An updated version of the original 2002 index was introduced in 2007 and it features a number of methodological improvements compared to the original version. Each of the variables is transformed to an index on a scale from 1 to 100. Higher values again denote higher levels of globalization. The data are transformed according to the percentiles of the original distribution. The year 2000 is used as the base year. The table 1 indicates updated weights of variables in the 2011 KOF Index of Globalization.

Tab. 1 Weights of variables in the 2011 KOF Index of Globalization

Indices and Variables		Weights (%)
Economic globalization		**36**
(I)	Actual economic flows	50
(II)	International trade and Investment restrictions	50
Social globalization		**38**
(I)	Data on personal contact	33
(II)	Data of information flows	36
(III)	Data of cultural proximity	31
Political globalization		**26**
(I)	Embassies in country	25
(II)	Membership in international organizations	28
(III)	Participation in U.N. Security Council missions	22
(IV)	International Treaties	25

Source: [2, p. 532]

The 2011 KOF Globalization Index (calculated from the data collected for the year 2008) covers 208 countries. Belgium, Austria, the Netherlands and Sweden have taken the first four places in the KOF index of globalization in 2011. Switzerland and Denmark ranked fifth and sixth place in the ranking. In contrast, for example, Germany on the sixteenth place is not among the 15 most globalized countries. First place in the ranking of the economic globalization is occupied by Singapore, followed by Luxembourg, Ireland, Malta and Belgium. In all the cases these represent small and open economies. Switzerland, Austria, Belgium, Canada hold leading positions in the case of measuring the social dimension of globalization. European countries occupy top positions in the political dimension of globalization: France, Italy, Belgium, Austria and Spain. [7]

2. Measuring of global competitiveness

Since 2005, the World Economic Forum has based its competitiveness analysis on the **Global Competitiveness Index (GCI)**, a comprehensive tool that measures the microeconomic and macroeconomic foundations of national competitiveness. The specific ranking of countries according to competitiveness can be seen as a way to assess the country's future economic potential and opportunities for its further development and growth. [8] "Competitiveness is defined as the set of institutions, policies, and factors that determine the level of productivity of a country. The level of productivity, in turn, sets the level of prosperity that can be earned by an economy." [9, p. 4] Index GCI is including a weighted average of many different components, each measuring a different aspect of competitiveness. These components are grouped into 12 pillars of competitiveness. (Tab. 2)

Tab. 2 The Global Competitiveness Index framework

Key for factor-driven economies	Subindex
Pillar 1. Institutions	25 %
Pillar 2. Infrastructure	25 %
Pillar 3. Macroeconomic environment	25 %
Pillar 4. Health and primary education	25 %
Key for efficiency-driven economies	Subindex
Pillar 5. Higher education and training	17 %
Pillar 6. Goods market efficiency	16 %
Pillar 7. Labor market efficiency	17 %
Pillar 8. Financial market development	17 %
Pillar 9. Technological readiness	17 %
Pillar 10. Market size	16 %
Key for innovation-driven economies	Subindex
Pillar 11. Business sophistication	50 %
Pillar 12. Innovation	50 %

Source: [9, p. 8]

In 2011 GCI Index is calculated for 144 economies. Top ten ranks remain dominated by a number of European countries, with Switzerland, Finland, Sweden, the Netherlands, Germany, and the United Kingdom confirming their place among the most competitive economies. Along with the United States, three Asian economies also belong among top 10, with Singapore remaining the second-most competitive economy in the world, and Hong Kong SAR and Japan being 9th and 10th. [9]

3. Methods

In the following part of the analysis, all the economies will be characterized by their overall level of globalization (KOF) and the three sub-components of globalization (economic, social, and political quantified by the corresponding values of KOF sub-indices). In all these economies, the value of the Global Competitiveness Index (GCI) will be monitored. To capture these linkages, the methods of **regression analysis** are used. For easier comparison and interpretation of the examined relationships, the correlation analysis was chosen as a suitable tool, although it assumes the linear character of the regression between the variables. This simplification makes it possible to compare not only the statistical power (robustness) of identified links (statistically significant at the customary 5% significance level), but also the intensity with which globalization is connected to competitiveness, or the slope of the linear relationship between the individual pairs of variables expressed by in the regression coefficient β_1 in the standard equation of the linear regression (1):

$$\hat{y} = \beta_0 + \beta_1 \cdot x \tag{1}$$

where x is the value of the independent variable (in this case the value of *KOF* globalization index and its sub-indices of economic globalization *EG_KOF*, social globalization *SG_KOF*, and political globalization *PG_KOF*) and $\hat{y}$ represents the model (estimated) value of the dependent variable (i.e. the values of GCI). Both regression (in our simplified case correlation) coefficients (β_0 and β_1) can be estimated using the following equations (2) and (3).

$$\beta_0 = \frac{\sum y_i \cdot \sum x_i^2 - \sum x_i \cdot \sum y_i \cdot x_i}{n \cdot \sum x_i^2 - \left(\sum x_i\right)^2} \tag{2}$$

$$\beta_1 = \frac{n \cdot \sum y_i \cdot x_i - \sum x_i \cdot \sum y_i}{n \cdot \sum x_i^2 - \left(\sum x_i\right)^2} \tag{3}$$

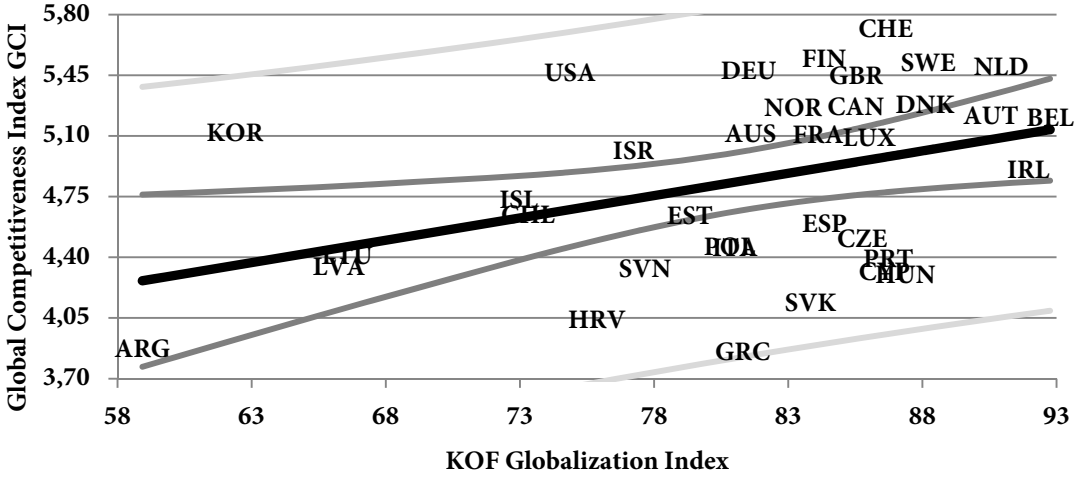
where y stands for the real value of the dependent variable (GCI) and n is the number of statistical units (35 developed market economies). [4] Individual correlation models will be evaluated based on their individual indices of correlation R_{XY} and also according to the calculated p-value of significance, according to which the robustness of a particular model is evaluated at the 5% significance level. For the following calculations and statistical analysis statistical software Statgraphics Centurion XVI was used. Strong black straight line represents the estimated correlation model, the narrow dark gray bordered strip shows the confidence interval for the mean forecast, the broader light gray bounded strip is the confidence interval for predictions. We can assume that the average values a given level of KOF index will fluctuate with a 95% confidence within the dark gray limits, expected specific values of the dependent variable will then with the same probability fall into the area between the light gray borders.

4. Results

For the following study, 35 (out of 47) of the developed countries have been chosen. The main criterion was a complex data matrix for both indicators and their components. Developed market economies (very high HDI) are: Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Chile (CHL), Croatia (HRV), Cyprus (CAP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Iceland (ISL), Israel (ISR), Italy (ITA), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Netherlands (NLD), Norway (NOR), Poland (POL), Portugal (PRT), Slovakia (SVK), Slovenia (SVN), South Korea (KOR), Spain (ESP), Sweden (SWE), Switzerland (CHE), United Kingdom (GBR) and United States (USA). For the analyses the latest available data for both GCI as well as KOF Globalization Index (and of their components) was used, which means the data of 2011.

The analysis of the links between the two indices (KOF vs. GCI) brought a proof of a weak but statistically significant relationship (see Figure 1). By means of a correlation analysis it is, however, not possible to assess the direction of the dependence: whether low competitiveness of countries results in their low globalization, or whether their limited involvement in international flow of goods, services, capital and labor decreases their global competitiveness.

Fig. 1 Relationship between Global Competitiveness Index GCI and KOF Globalization Index



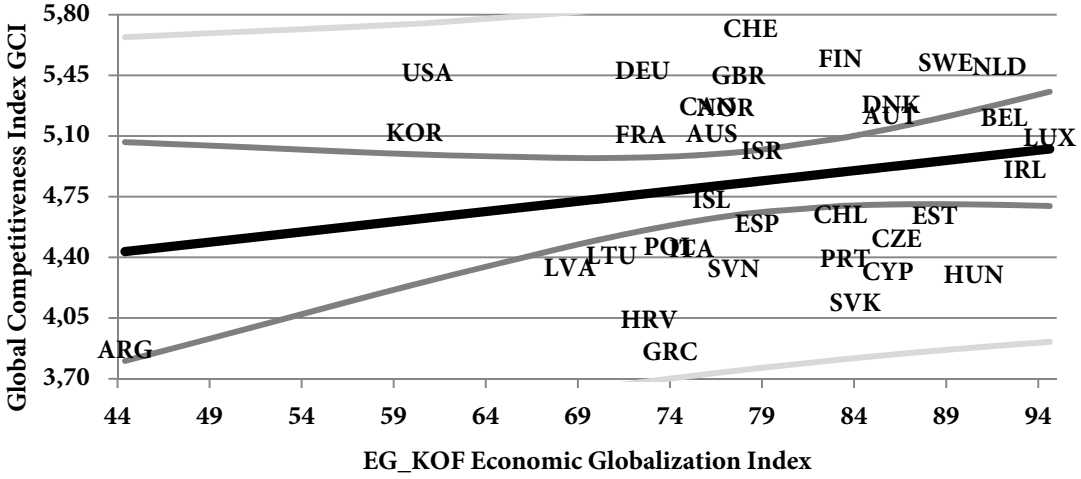
Source: own construction

Developed market economies are characterized by a high degree of globalization and classified by a very high index of global competitiveness. Countries with the highest global competitiveness, like Switzerland, Finland, Sweden, Germany and the USA also belong among the most globalized world economies. A statistically significant association between whole globalization and global competitiveness was demonstrated. This however does not represent intensive relationship, with correlation index R_{XY} of 39.96 % indicating moderately correlated relationship between the indicates. The slope

of the model line β_1 = 0.0257 expresses the fact that the increase of KOF by one point brings an increase in average GCI by as little as 0.0257 point in the developed countries. In the case of the top developed countries (e.g. Belgium, Austria, or the Netherlands), the power of globalization to promote their competitiveness seems to be exhausted. South Korea, the United States, Norway and Germany reached the highest degree of global competitiveness compared to the values estimated according to the intensity of their globalization. The possibility to stimulate the global competitiveness by promoting globalization is therefore useful only for economies with low values of both monitored indices (such as Lithuania, Latvia, Croatia, or Argentina). Countries of Southern Europe, Greece, Croatia, Slovakia and Hungary belong among countries with the lowest values of the global competitiveness. The main problems of these countries are low effectiveness of their labor markets, financial markets, low technological effectiveness and insufficient innovation effectiveness connected with it.

Index of economic globalization EG_KOF as one of three components of the KOF Globalization Index reflects economic and business links of the national economy to the world economy. Economically globalized countries with a very low level of global competitiveness include e.g. Slovakia, Hungary, Croatia and Greece. The analysis of the relationship between economic globalization (EG_KOF) and competitiveness (GCI) shows a very surprising conclusion: global competitiveness in the developed market economies is not significantly correlated with economic dimension of globalization, see Figure 2. The developed market economies have already passed through stages of factors oriented economies and efficiently oriented economies and now they can increase their global competitiveness by means of technologically and innovatively oriented economic approach.

Fig. 2 Relationship between Global Competitiveness Index and KOF Economic Globalization Index

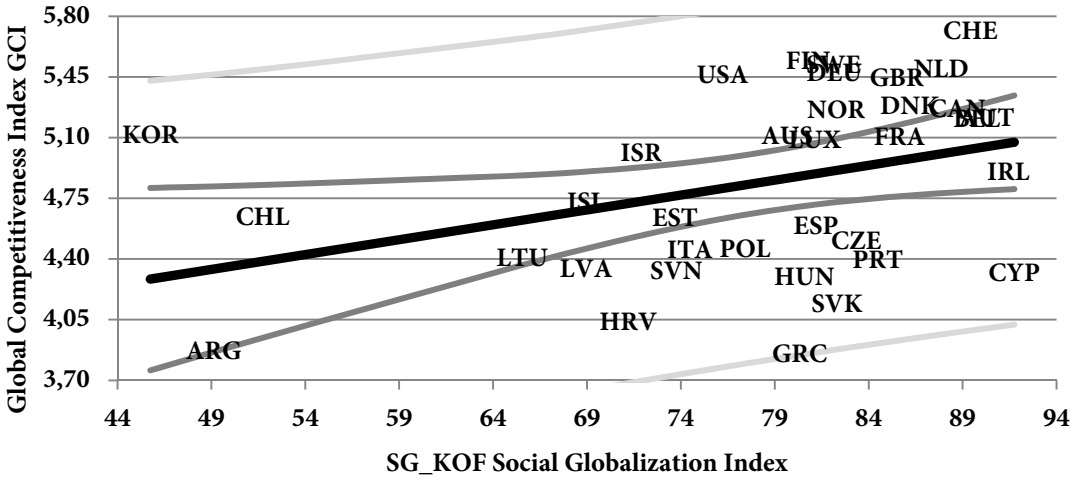


Source: own construction

The following Figure 3 illustrates the relationship between SG_KOF Social globalization index and Global Competitiveness Index GCI. The social dimension as a "spontaneous and less politicized layer of globalization is remarkably efficiently helping people all around the world to improve their standards of living, their health conditions, and

access to education" [1, p. 69]. The social globalization index SG_KOF primarily pursues the personal and social international relations and communications which are strongly developed in the developed market economies. Correlation index R_{XY} at the value of 36.82 % with the slope of the regression line β_1 = 0.0172 indicates moderately correlated relationship between indexes. The increase of SG_KOF by one point brings an increase in average GCI by as little as 0.0172 points in the developed countries. Greece is the only country that finds itself just on the border of the confidence interval which, due to the deepening economic and debt crisis in the country, had fallen to the bottom in terms of global competitiveness. Also Argentina is at a very low level of global competitiveness, but due to a low value of social globalization it is possible to increase its global competitiveness in this way. Chile and South Korea are other countries that could gain from an increase in social globalization.

Fig. 3 Relationship between Global Competitiveness Index and KOF Social Globalization Index

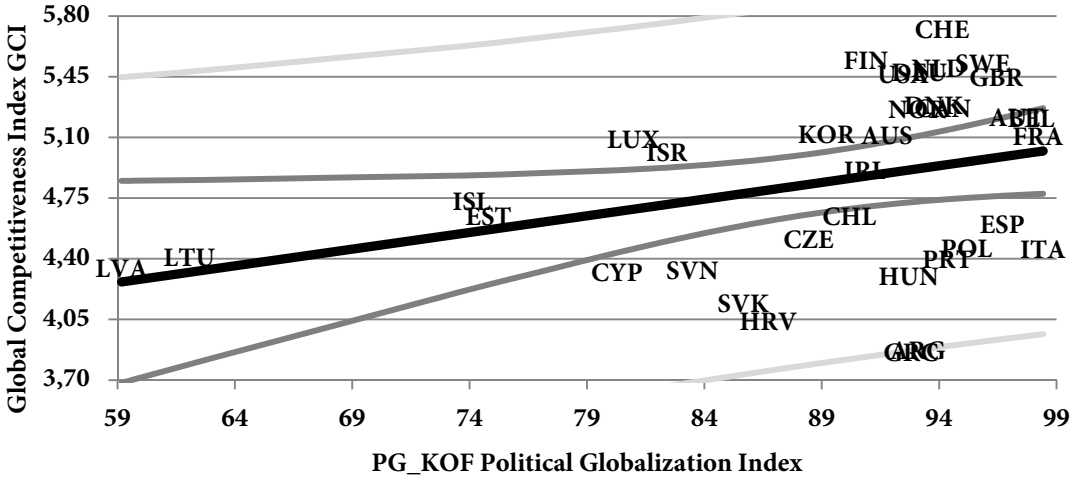


Source: own construction

The relationship between GCI and PG_KOF Political globalization index is the weakest linkage of the analyzed indicators (coefficient of correlation R_{XY} = 34.28 %, β_1 = 0.0192, see Figure 4).

In the case of political globalization, which is characterized by the involvement of countries in international organizations, signing international agreements and participation in international missions cannot be expected to have significant links with competitiveness. The developed market economies have significant and very similar involvement in political international relations. Therefore, even high political involvement of Greece and Argentina in the processes of globalization does not help to increase their global competitiveness.

Fig. 4 Relationship between Global Competitiveness Index and KOF Political Globalization Index



Source: own construction

All the correlation analyses for the developed market economies have been summarized in the following table 3. Correlations statistically insignificant at the 5% level of significance are indicated in the table in gray.

Tab. 3 Correlation Characteristics for the Developed Market Economies

	KOF	*EG_KOF*	*SG_KOF*	*PG_KOF*
GCI	α = 0.0174	α = 0.1813	α = 0.0295	α = 0.0438
	R_{XY} = 0.3996	R_{XY} = 0.2313	R_{XY} = 0.3682	R_{XY} = 0.3428
	β_0 = 2.7479	β_0 =3.9101	β_0 = 3.4988	β_0 = 3.1288
	β_1 = 0.0257	β_1 = 0.0118	β_1 = 0.0172	β_1 = 0.0192

Source: own construction

Conclusion

The aim of the article was to answer the question whether the developed market economies can increase their global competitiveness by intensifying of globalization processes. It is possible to conclude from the results achieved in the paper that globalization remains primarily a very strong and powerful economic phenomenon: more globalized countries are more developed. A statistically significant association between globalization and global competitiveness was demonstrated but in the case of the top developed countries the power of globalization to promote their competitiveness seems to be exhausted. There are weak links between social globalization and political globalization and global competitiveness in the developed market countries (coefficient of correlation R_{XY} < 40 %). The possibility to stimulate the global competitiveness by promoting social globalization or political globalization is therefore useful only for economies with low values of these monitored indices [6]. The economic dimension of globalization is not statistically significantly correlated with global competitiveness in the developed market economies. The developed market economies with a high value of the Human Development Index (HDI) are also

characterized by a high degree of engagement in international relations. Technological and innovative processes represent possibilities how developed market economies can increase their global competitiveness.

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The Determinants of the Adoption of a Political Risk Assessment Function in Czech International Firms: A Theoretical Framework

Abstract

This theoretical paper seeks to conceptualise a new approach to the identification of the factors influencing the adoption of a political risk assessment (PRA) function. First of all, we identify political risk (PR) as any host government action and/or inaction or an action against a host government that could threaten business activities of firms; and PRA as the process of analysing and evaluating such risks. The research population will comprise a convenience sample of Czech international firms. The information whether or not a firm has set up a PRA function will be obtained via a questionnaire survey. Previous studies aimed at PRA were concerned with firm's size, degree of internationalization, ownership and industry. By making use of firm value maximization and risk aversion and considering the rationale for risk management activities: (i) reducing the expected costs of financial distress; (ii) reducing the risk premiums payable to various partners; (iii) increasing investment possibilities; and (iv) reducing expected tax payments, we develop a number of determinants which can be employed in PRA studies; namely firms' complexity, location of subsidiaries, leverage, auditor type and investment opportunities. In addition to the above mentioned theories this concept makes use of the enterprise risk management (ERM) theory, and the determinants of the adoption of an ERM function.

Key Words

Czech Republic, international firms, investment, political risk assessment, political risk

JEL Classification: D72, D73, D81, F64, P20, P48

Introduction

Any firm is subject to "political exposure", whether directly or indirectly, and political risk (PR) is an ever-present threat. Just like any other risk, PR is magnified in the context of the international business environment and in globalized markets. Given the recent developments in the global business arena, after the global economic downturn in 2007, it has been suggested that the post-crash period is a new era for PR with new threats and increased uncertainties [1].

Since PR is closely linked to and in many cases affects directly all social, cultural, financial and economic risks, there should be a greater emphasis on PR in the academic literature. This argument is also supported by the fact that there are a growing number of companies engaged in international economic relations, including trade and foreign

direct investment, with emerging markets. One of the main characteristics of these regions is unstable political and economic environments [2], [1], [3].

Since the existing literature on risk focuses predominantly on risk management in general or, more recently, on enterprise risk management (ERM) in which PR is already implemented in a risk management conceptual framework (e.g. [4], [5]), we know only a little about the role of PR itself within firms. There have been some studies conducted which are concerned with PR and PRA (e.g. [6], [7], [8]). However, the outcomes of these studies have identified a limited number of determinants of PRA adoption e.g. firm size [8]; degree of internationalisation [6], [8]; ownership [8]; or industry type [7], [8]. We believe that an expansion of the determinants of PRA adoption and a more in-depth analysis of the PRA function are necessary.

In order to develop further the determinants of PRA adoption, we make use of the firm value maximization theory and the theory of risk aversion which are linked closely to the theory of shareholder value maximisation and profit generation as a rationale for risk management (RM) and by extension political risk management (PRM). Although these theories usually underpin studies aimed at corporate risk hedging (e.g. [9], [10]), since hedging activities are included within RM activities in the majority of firms, they can be used to identify some of the determinants of PRA adoption [4].

The above mentioned arguments have been used to determine the factors which influence the adoption of enterprise risk management (ERM) in a firm. Even though ERM is a broader concept than PRA and PRM we argue that, as part of ERM, the determinants of PRM and by extension PRA adoption can also be examined using the theories of risk aversion and value maximization hypothesis under which the activities of risk management in general are justified by (i) reducing the expected costs of financial distress; (ii) reducing the risk premiums payable to various partners; (iii) increasing investment possibilities; (iv) reducing expected tax payments. This allows us to use a more quantitative approach to the determinants of PRA adoption and we propose to use a model enabling us to predict the likelihood of a firm having a PRA function implemented within its risk management activities; which – to our best knowledge – has not been done in any of the previous studies of PRA.

1. Literature Review

The terms uncertainty and risk sometimes are used interchangeably. There is however a clear distinction between the two. Uncertainty is the state of knowing that something might happen in the future but not knowing what exactly is it going to be and risk provides the information on its degree [5]. While uncertainty is not measurable, risk can be defined using a simplified model as the probability of an adverse event occurring times its magnitude. In terms of political risk assessment, it is the process of converting the uncertainty arising from politics into 'quantifiable' risk.

1.1 Political Risk

The concept of a quantified risk in the field of political risk is often employed in studies aimed at political risk in the context of FDI or portfolio returns [11]. In these studies, political risk usually overlaps with country risk. However a distinction between political risk and country risk needs to be made [8]. Whereas country risk is often referred to as all social, cultural, political and economic risks faced by a firm when operating in that country; a political risk is linked directly to government actions or to actions aimed against a government. This is however a very simplistic delimitation of PR. The exact definition depends on many factors; the insurance industry for example divides PR 'into (i) currency convertibility and transfer, (ii) expropriation, (iii) political violence, (iv) breach of contract by a host government, and (v) the non-honouring of sovereign financial obligations [and is only aimed at the host country]' [1, p.28]. In management research, PR is usually defined as the likelihood of deterioration in the political climate in a host country or simply as an action of a political institution – both voluntary and/or involuntary – that would threaten the objectives of a firm. Given that the priority of a profit making firm is profit generation, a description of PR as an action and/or inaction of a host country government threatening firm's profitability seems to be an appropriate one for the purpose of this research.

Although the exact definition of PR is sometimes unclear, the determination of the elements constituting a political risk is an even more 'controversial' topic. Even after more than four decades of intense discussion, academics still struggle to determine what exactly PR consists of and to what extent it influences other risks faced by firms. Nevertheless, they agree on the fact that given the nature of political risk, due to which PR is part of all risks which firms face, it should be of major concern to any firm and its management that they should benefit from the implementation of a PRA function within their risk management activities [12], [7].

1.2 Political Risk Assessment

Political risk assessment (PRA) is the process of analysing and evaluating political risk while undertaking international business activities; it has been suggested that it should be one of a number of risk management activities. The extant literature suggests that there has been a low standard of PRA undertaken by international firms; which indicates either a lack of political risk awareness by international firms or their resistance to the perception and/or experience that political risk can be adjustable to analysis. However, political risk is assessable and helps the decision maker to avoid or decrease the chance of various material losses by the use of appropriate management tools. The literature also suggests that international firms are aware of their exposure to political risk and often consider political risk to be one of the most important risks for their international business activities [12], [7], [8].

The diversity of potential risks and the differences in a firm's exposure to risk may lead to different approaches to PRA. A firm's exposure to political risk is related to its characteristics. The literature on political risk suggests that the extent to which international firms are involved in PRA is correlated with a number of organizational characteristics such as firms' size [8]; firms' degree of internationalization [6], [8]; firms' industry [7], [8]; and firms' ownership [8].

Firms benefit from the adoption of PRA by decreasing the uncertainty arising from the political environments in which they operate. They can also, by adopting effective and appropriate mitigation tools, increase a firm's stability; hence leading to a decrease in the volatility of a firm's performance and its cash flows. Therefore, in this article we build upon the concept of PRA adoption in firms. In view of the theory of firm value maximization and risk aversion we attempt to contribute to the existing literature on the determinants of PRA adoption by enlarging the number of these determinants of the PRA adoption decision, i.e. the decision whether or not to assess formally a firm's political risks.

2. Determinants and Hypotheses Development

The literature on both risk management implementation and the determinants of firms' hedging behaviour suggests that the most important determinants are firm size, industry and complexity, the level of a firm's internationalisation, liquidity, managerial ownership, institutional ownership, past performance, location of headquarters and subsidiaries, liquidity, growth options, cash flow volatility, tax losses, return on assets, CAPEX, dividend yield, industrial diversification, type of auditors, independence of board of directors, assets' opacity and stock price volatility [13], [10], [14], [5].

Given the nature of the Czech business environment and, in particular, the fact that not all the firms in our sample are publically listed, we propose the following determinants to be employed in our study: 1) firm size; 2) firm complexity; 3) level of internationalisation; 4) ownership; 5) location of subsidiaries; 6) leverage; 7) growth options; 8) auditor type; and 9) industry. We already have the information about whether or not a firm has adopted the PRA function; hence we use a dummy variable to indicate the use of PRA. The proposed determinants will enable us to explain such a decision at a firm level and each will be explained and developed below.

2.1 Firm Size

Firm size influences the nature and the extent of risks threatening business as well as the structure of a firm. It is one of the variables included in almost every study where firm-specific determinants are tested. As [12] suggested, the bigger a company is the more likely it is to identify any potential risks and also the more resources it has to mitigate its risks. However there is an argument that managers may be overwhelmed by their workload and hence not have the capacity to conduct PRA [8]. Moreover, smaller firms are also much more adaptable and flexible and therefore in the event of an

emergency are likely to deal with these situations much more quickly [8]. In addition large firms have a greater volatility in operating cash flows and risk of financial distress; due to which the likelihood of PRA adoption is greater [5], [15].

2.2 Firms' complexity

The 'complexity' variable is usually employed in studies of ERM implementation (e.g. [15], [5]). Firm's complexity can be measured by the number of its business segments; the more segments a firm has the more complex it is. In line with previous studies, we argue that the more segments a firm has, the more difficult it is to align its activities, and hence the more likely it is to implement a risk management unit and, by extension, a PRA function.

2.3 Level of internationalisation

The more activities a firm has abroad the more it is exposed to host-country risks including political risks [7], [8]. In line with previous studies the indicators of firms' level of internationalisation are 'number of years in international business', 'number of countries of functioning' and 'percentage of revenue from international business activities'. Although these methods are all used to determine and indicate firms' level of internationalisation, their relationship with PRA adoption is not explicit.

For example, in the case of 'years in international business', higher values would suggest higher levels of exposure; however it has been pointed out that the experience will result in a reduction in risk perceptions over time. The results for 'number of operating countries' and 'foreign revenues' suggest a significant positive relationship with PRA implementation for both of these variables [8]. However, the diversification of firms' activities across multiple markets can lead to the offsetting of losses and gains by portfolio diversification in which case the effect of the 'number of operating countries' may be arguable. Nevertheless previous studies have found that both the 'international revenues' and the 'number of countries of operating' are positively correlated with PRA adoption [6], [8].

2.4 Ownership

In the Czech Republic, where the 'German' model of financing applies, rather than the 'Anglo-Saxon' one, the Czech stock exchange has not developed significantly. Our sample consists of both publicly listed and private firms. Therefore we intend to use a dummy variable to indicate the legal structure of a firm rather than the percentage of managerial and/or institutional ownership. The studies of [4] and [15] identified that more formal risk management is implemented in firms with a higher percentage of ownership by external stakeholders who require information about a firm's activities and the amount and nature of its risks. This trend is expected to be magnified by the events of 2007. We

intend to test for the 'ownership' variable twice: a) according to firms' ownership, i.e. state-owned versus private firms; and b) according to firms' legal structure, i.e. publicly listed versus private firms.

Firms owned by government are usually more risk-averse than private ones. This is caused mainly by the different objectives of their managers since the primary goal of private organisations is to generate profit whereas the public ones need to ensure that they serve the public interest in the first place [16]. The ownership structure of publicly listed versus private firms appears to influence how companies perceive and tackle risks. Publicly traded companies need to ensure that they will not only generate profit but will also meet their shareholders' expectations which – in most cases – are profits. Therefore these companies are much more likely to monitor and assess potential risks stemming from the environments in which they operate – including the political ones [8].

2.5 Location of subsidiaries

Given that our whole sample is based in the Czech Republic or in Slovakia, we do not need to control for the location of firms' headquarters (with the exception of a comparison between Czech and Slovak firms). However, it has been suggested by [5] that firms from more developed countries seem to be more risk-averse than those from less developed countries and do not want to be 'caught unprepared'; and therefore the standard of risk management in these countries will be higher. In addition, the fact that the ERM frameworks have been invented and developed in the UK, and adopted mainly in the US, Canada, Australia and New Zealand is instructive [4], [17], [5]. The fact that these countries have rules and regulations in their legal systems which put an emphasis on corporate risk management (e.g. the 4360 standard or the Sarbanes Oxley Act) pushes firms operating within these countries towards a more responsible approach to risk management and risk in general. Therefore firms with subsidiaries in these countries will be more inclined to adopt risk management approaches and they will be more likely to adopt PRA than firms whose subsidiaries are located elsewhere.

2.6 Leverage

Leverage is linked directly to the costs of financial distress. A firm with a large percentage of debt compared to its assets will face issues relating to its ability to repay its debt. In order to ensure that a firm will have enough resources to cover its liabilities, it will need to ensure steady cash flows; i.e. such a firm will seek to reduce the volatility of its cash flows. However reducing cash flow volatility is only one of the justifications for the adoption of a risk management function. The 'hedging literature' (e.g. [9], [18], [10], [14]) also suggests that the more a firm is leveraged, the more likely it is to hedge. From the financial management perspective, leverage brings great risk in the form of an interest rate risk to a firm linked – directly or indirectly – to politics [19]. Although it has been pointed out that firms from more stable economies are generally more likely to be

leveraged [20]; the Czech and Slovak economies are very similar and therefore this variable should not impose any bias on the analysis.

2.7 Investment opportunities

The rationale behind making use of investment opportunities as a means of PRA adoption is identical to the one for leverage – reducing cash flow volatility. In firms with more opportunities for investment, such as research and development or expansion, managers need to make sure that the firms will be able to finance these investments. In line with previous studies where the investment opportunities variable has been employed, we use 'expenditures on research and development' as a proxy for firms' investment opportunities [9], [14].

2.8 Auditor type

Auditor type is – to the best of our knowledge – a new variable in the literature of PRA. It has been suggested that the type of a firm's auditor affects a firm's risk management [17]. [5], having followed this hypothesis in their study of ERM implementation, found that the presence of a 'Big Four' (KPMG, Deloitte, Price Waterhouse Coopers, Ernst & Young) auditor increases the likelihood of ERM implementation. The "Big Four" acknowledge PR as one of the major threats for firms and suggest that PRA should be undertaken by all firms, especially those operating internationally. It is logical to assume, therefore, that the presence of one of these auditors will be influential in the process of PRA adoption [1].

2.9 Industry

The existing literature on PRA suggests that there are significant differences between companies which are tightly linked to the host-country governments in which they operate, such as construction, military or extracting companies, whose activities are of a contractual nature; whereas sectors over which the host-country governments have only little control would probably not worry about the potential risks stemming from the host-country political environment as much as the previous group. We do not suggest that companies from 'low-profile' sectors are not exposed to political risks at all. However the nature of the PR to which these sectors are exposed is macro environmental, rather than industry-specific [7], [8], [21].

Many approaches to the treatment of this variable have been developed in previous studies; these mostly distinguish between a) primary, secondary and tertiary sectors; and b) industrial and manufacturing, service and financial companies; c) many specific industrial branches. We use the following sector classification: 'manufacturing', 'service', 'military', 'extracting', 'construction'and 'financial'.

From the discussion above of the proposed variables some tentative research hypotheses were developed. These are summarized in Tab. 1 below. It needs to be pointed out that these hypotheses will all comprise a predicative model, and therefore the higher number of the developed hypotheses will not impose any obstacles on the research model itself.

Tab. 1 Hypotheses Overview

Variable	Hypotheses
Size	Larger firms are more likely to adopt PRA function.
Complexity	More complex firms are more likely to adopt PRA function.
Internationalisation	Firms that are more internationalised are more likely to adopt PRA function.
Ownership	Publicly owned firms are more likely to adopt PRA function than private firms. Publicly listed firms are more likely to adopt PRA function than private firms.
Subsidiary	Firms with subsidiaries in UK, US, Canada, Australia or New Zealand are more likely to adopt PRA function.
Leverage	The more leveraged a firm is the more likely it is to adopt a PRA function.
Investment Opportunities	Firms with more investment opportunities are more likely to adopt a PRA function.
Auditor Type	Firms are more likely to adopt a PRA function when employing a Big Four auditor.
Sector	The adoption of the PRA function varies between sectors.

Source: Developed by authors

3. Research Contribution and Limitations

The rationale behind this proposed research is twofold. From a theoretical perspective, this study will enrich the literature on firm-specific determinants of PRA adoption. None of the previous studies of PRA has used variables such as the presence of a Big Four auditor, firm complexity or leverage, which are expected to influence significantly the decision whether or not to adopt a PRA function. In addition to a number of 'new' variables, the methodology is also innovative. In line with previous PRA studies, primary data will be obtained via questionnaires; however the analysis of PRA adoption and its determinants will make use of secondary data to identify the firm-specific determinants. The geographical context of the study will also contribute to the existing PRA literature. No previous PRA research has been conducted in Central Europe. This is a significant omission given the specific post-socialist transition market context. In addition to the specific market characteristics, it has also been pointed out that the differences between well-developed western markets and the Central and Eastern European ones are diminishing; hence the time left for studying the PRA function in this particular context is running out [22].

Given the nature and the scope of the study, there are some limitations that need to be pointed out. First of all, due to limited time and resources, the dataset is cross-sectional and therefore it will not allow us to map the historical development of the PRA adoption time. To produce a longitudinal dataset for our sample would be particularly difficult given the manner in which information is stored in the Czech Republic which makes it difficult to gather comprehensive historical data. Moreover, rules and regulations in this region are still not a strong enough incentive for firms to publish complete financial information. Additionally, this research investigates both public and private companies.

It would be particularly interesting to test for the determinants of PRA adoption among a sample of only publicly traded firms. This would allow the inclusion of determinants such as dividend pay-outs, managerial and/or institutional ownership, past performance and stock price volatility; and secondly, the information available for these firms would be more complete and accessible.

Conclusions

In conclusion, the aim of this paper is to provide a new approach to the examination of the determinants of PRA adoption. From a review of appropriate literature on political risk and its assessment, risk management, ERM adoption and corporate hedging incentives, the following determinants of the adoption of a PRA function were identified: firm size, complexity, industry, leverage, investment opportunities, type of auditor, ownership, level of internationalisation and location of firms' subsidiaries. A theoretical model for predicting the likelihood of firms being PRA adopters was developed based on these determinants. Although there are still limitations of the study, we believe that by further development of a predicative model the use of the proposed approach has the potential to contribute significantly to the PRA literature.

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Innovative Methods of Regional Availability Analysis as a Factor of Competitiveness

Abstract

Regional competitiveness is strongly dependent on the accessibility of a region. Innovative tools are sought for analysis and prediction. The precedent analysis is one of these tools[1]. Through this analysis we can compare disparate variables. We can describe and analyse stocks and flows too. This way we can compare transport infrastructure changes and economic variables changes. There is a possibility to describe the evolution and impact on the environment. By using the first precedence of this analysis we can find the frequency of observed changes in the area. The range (distance) changes of selected variables in the area we find by using multiple precedence. The article demonstrates the method on the example of road access to regions of the Czech Republic. Comparing different types of region´s roads were created directions border flows. These flows were described by binary precedence matrices. Square precedence matrices have been calculated for all regions and groups of roads. Thus were made multiple precedencies. Those precedencies are recorded by matrices, charts and maps. By using the criteria there can be set a boundary threshold. For the basic research the threshold is set around the average values. To determine the direction of flow of the individual variables can be used multicriteria threshold. For the demonstration of the method there is applied the difference of observed variables averages. Referred method allows comparing the increases and decreases in the values of selected road network. The article compares the percentage ratios of the sums given for regions and sums given for road types. For the basic understanding and for demonstration of the method there have been compared the precedence in two categories by quality. Comparison is done on the highway and motorway and from the first to third class local roads. Above mentioned method is further extended for example by the monitoring of border flows or cyclical events. Binary matrices are use for research of the precedence existence. By using of numeric precedence matrices there can be defined the frequency of precedence.

Key Words

precedence, incidence matrix, region, Czech Republic, infrastructure, road network

JEL Classification: O18, C65

Introduction

Competitiveness is basic precondition for development. Standard methods of economic analysis provide equal opportunities to all subjects for market analysis. Substandard

[1] For inclusion, see [1], [2], [8], [11], [12]

approach to used methods can bring new and previously unknown results. We need innovative methods to analyze and compare flows, disparate and state variables regardless of the enviroment. Such a method can be precedence analysis. Principles are based on the graph theory and system analysis and there exists relatively developed mathematical apparatus [2]. In several research projects at the Silesian University in Opava[1] have been carried out analysis of economic variables and their reciprocal comparison. Within this research are identical factors and trends searched. An undeniable factor that affects the development of regions is transport accessibility. Therefore, the research is focused on the comparing changes in transport and changes in the economy. Due to the location of the Czech Republic, is also important factor relationship with European corridors and infrastructure. The presence of European transport infrastructures is not always benefical for regions. There are many other factors, such as backbone links of European moves at national and regional level. Absence of links (motorway feeder, logistics centers, multimodality, etc.) may lead to environmental stress, the lose of workforce, traffic accidents or other negative phenomena[2] at all. From the above mentioned artice results that it is necessery to analyze variol large and complex systems. It is necessery to be able to quantify and use these variol links as kriteria. As stated earlier, it is important to analyze flow variables and states variables. Last but not least, it is necessary to find a comparative mechanism for comparison of asymmetric variables. The tool that meets these criteria is the case analysis. The basic idea is based on the philosophy that the individual economic variables are not compared, but their impact on the enviroment. A measurable variable, in this case is increase or decrease, respectively to the rate of increase or decrease of the quantities at some point (increase the value of the attribute element) to the vicinity of this point. These procedures were successfully used for example in the European structures in the analysis of immigration flows[3], evaluation of education and unemployment[4], in the Czech Republic in the analysis of accessibility[5] and the unemployment rate in the Moravian-Silesian region in the analysis of municipalities with extended powers[6]. The principle was successfully used to analyze the impact of the crisis[7]. The whole method is very flexible and essentially independent of the environment. The model can be applied to any real object by changing resolution levels, selecting elements and definition of links. The links in the system are based on the methods of structural analysis, when the spatial criteria is established for the existence of structure (such as adjacency of regions, physical crossing of roads, etc.[8]). The quantification of the binding parameters (orientation, frequency, robustness, etc.) is

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[1] SGS – 24/2010 Use of BI and BPM to support effective management, 23/2010 Fiscal policy in the context of the global crisis and its impact on business, SGS 5/2013 Precendence Analysis of Selected Parameters Influencing Interaction Between Traffic Infrastructructure and Regional Expansion, CZ. 1.07/2.4.00/12.0097 „AGENT“

[2] For more information, see [3]

[3] For more information, see [9]

[4] For more information, see [5], [6]

[5] For more information, see [10]

[6] For more information, see [6], [7]

[7] For more information, see [4]

[8] For more information, see [3], [10]

mostly expressed as the difference among the relevant values of the variables among elements with defined binding, but it can be calculated on the basis of multi-criteria evaluation. The advantage of this method is considerable flexibility in the definition of the links and easy recording method. If we want to analyze other relationships, such as relationships among all regions, not just among adjacent, then we simply write the links to the incidence matrix to the places of the required bonds. Last but not least it is necessery mention the advantage of the method is sufficiency of standard spreadsheet (MS Excel) and conventional matrix operations that we simply modify to the binary operations and it is easy to algorithmic.

1. The definition of the system and the data

To demonstrate the method in this article was created model based on the regions of the Czech Republic. Individual region forms element of the system. The links are defined when the the regions adjacent or the regions adjacent with the enviroment.

Fig. 1 Percentage calculation for creation of Precedence

	percent of roads - total					percent of regions - total				
regions	Motorways	Highways	Road I. class	Road II. class	Road III. class	Motorways	Highways	Road I. class	Road II. class	Road III. class
Praha	12,694611	40,239521	11,616766	35,449102	0	1,4443385	7,9564291	0,1663152	0,2022576	0
Středočeský	2,0151499	1,578292	6,8610563	24,625921	64,918543	26,461371	36,017049	11,336865	16,216142	18,331253
Jihočeský	0,2512727	0,1207414	10,666036	26,820911	62,142671	2,0983785	1,7523088	11,208271	11,232132	11,159555
Plzeňský	2,12907	0	8,206278	29,245467	60,417235	14,879411	0	7,216707	10,249542	9,0797747
Karlovarský	0	1,3292434	10,161652	22,928231	65,580874	0	6,4645986	3,5783482	3,2176729	3,9465434
Ústecký	1,2513977	0,2926272	11,424357	21,564009	65,467609	7,167189	2,9126214	8,2334585	6,1934567	8,0630322
Liberecký	0	0,9153507	12,79017	20,063497	66,226859	0	5,2569264	5,3186564	3,3249515	4,7063167
Královéhradecký	0,4452808	0	11,776087	23,666145	64,115137	2,2891402	0	7,6179209	6,1012108	7,087897
Pardubický	0,2443291	0,0860705	12,67457	25,332482	61,659772	1,1990734	0,7340753	7,8271008	6,2344549	6,5071524
Vysočina	1,8138678	0	8,3810495	32,14958	57,655502	12,603897	0	7,3281553	11,20275	8,6150619
Jihomoravský	3,0021651	0,57588	9,3926475	32,901051	54,128256	18,326748	6,1094009	7,2149924	10,071883	7,1054775
Olomoucký	0,9310413	2,5379287	9,6497378	25,906503	60,974789	4,5237771	21,430263	5,8999023	6,3123514	6,370903
Zlínský	0,5841121	0,7476636	15,985981	26,757009	55,920561	1,7032293	3,7887758	5,8656105	3,9125919	3,5064433
Moravskoslezský	1,5592213	0,9326183	19,016671	23,577757	54,913733	7,2898215	7,5775515	11,187696	5,5279198	5,5208828

Note: The names of regions in the Czech language

Source: own, initial data: www.rsd.cz

The links among elements are expressed by incidence matrix. Based on the data of Directorate of roads and highways and length of relevant roads categories[1] there were calculated percentage ratios for each category (Figure 1). These percentage calculations were calculated in relation to the total length of the respective category in all regions and to the total length of the roads of all categories in the region.Finally the two qualitatively different groups were compared, the sum of motorways and highways (expressways) (M+H) and roads for the sum I. to III. category. Orientation of the links in the system was designed for these groups by comparing the percent of adjacent regions. Orientation of the links to the enviroment has been set for this post exhaustively based on the average percentage changes in the group. In total there were analyzed four different groups. For each group the Incidence matrix was transferred to the Precedence

[1] Reports from the information system of road and highway network, the Czech Republic, modified date 2011 to January 1, 2013, http://www.rsd.cz/Silnicni-a-dalnicni-sit/Delky-a-dalsi-data-komunikaci, online 1. 4. 2013

matrix (Figure 2). During the transfer of the precedence matrix, there was controled the corectness of the system.

Fig. 2 Precedence determination based on percent

Region	% Roads in the region	Incidencies													Precedencies												
Praha	52,93413174		1																								
Středočeský	3,593441943	1		1	1		1	1	1	1	1					1												
Jihočeský	0,372014097		1		1						1	1			1		1		1						1	1			1
Plzeňský	2,129069994		1	1		1	1								1		1												1
Karlovarský	1,329243354				1		1								1				1		1								1
Ústecký	1,544024933		1		1	1		1							1		1		1										1
Liberecký	0,915350678		1				1		1						1		1				1								1
Královéhradecký	0,445280818		1					1		1					1		1					1							1
Pardubický	0,330399534		1						1		1	1	1		1		1						1		1	1	1		1
Vysočina	1,813867754		1	1					1		1						1									1			
Jihomoravský	3,578045133			1					1	1		1	1		1														1
Olomoucký	3,468969966								1		1		1	1	1											1			1
Zlínský	1,331775701										1	1		1	1											1	1	1	1
Moravskoslezský	2,49183959											1	1		1												1		1
Surroundings	5,448389659			1	1	1	1	1	1		1	1	1	1															

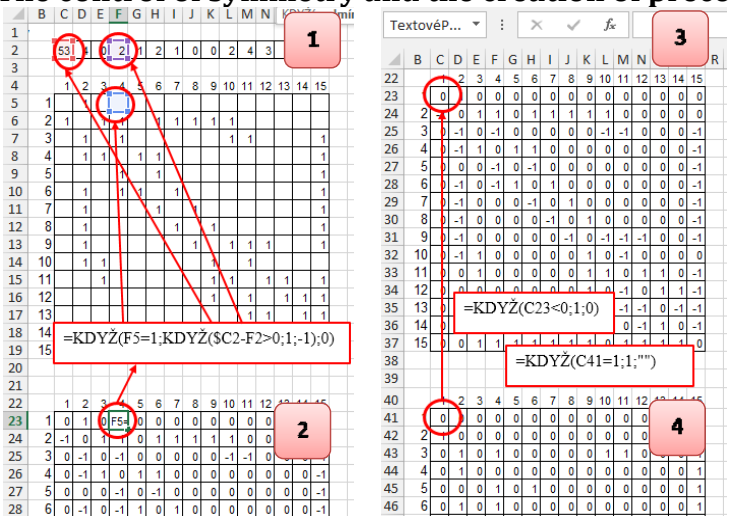
Note: The names of regions in the Czech language

Source: own

2. The precedence of the matrix, creation of precedence matrix

Based on the mentioned values were progressively found differences in the length of the various categories of roads among regions. By comparing the values in each region were determined directions of subsidence values among individual regions.

Fig. 3 The control of symmetry and the creation of precedence



Source: own, using MS Excel (Czech localization)

The direction is assignemnt to the linkage among the links. The element, which in the direction of the session precedes another element, is referred as the precedent (the predecessor). Setting guidelines enables the construction of directed graphs and creation of precedence matrix [7].

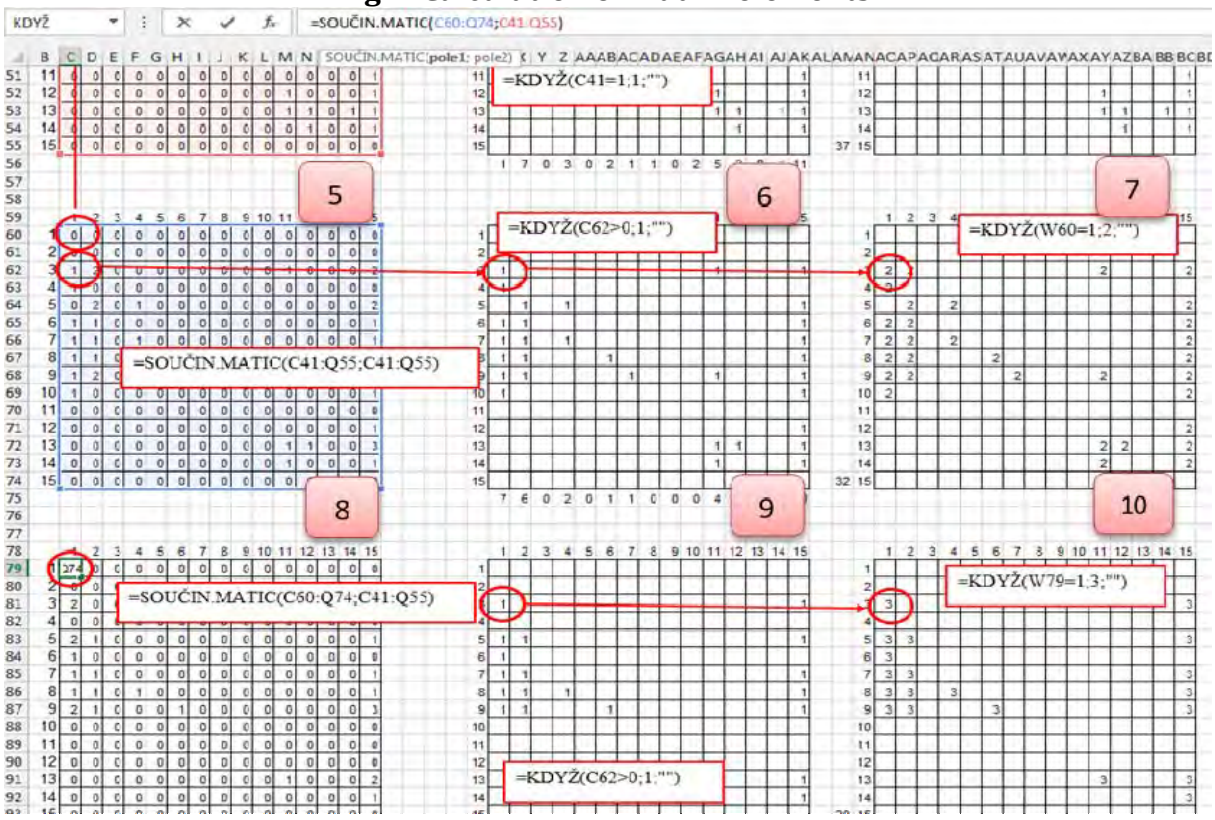
The matrix group shows the process of creating precedence in MS Excel (Figure 3). Based on the vector with proportional values and incidence matrix (matrix 1) was performed the symmetry control and there was created the matrix of which the decrease and increase in percent among adjacent objects was expressed by the value "1" or "-1" (matrix 2). This matrix was transferred for further calculations of matrix patterns to the matrix of values (matrix 3) and after supervision of the symmetry was eliminated negative component. This led to creation of the precedence matrix for selected group of data. The precedence is recorded by using the precedence matrix (matrix P). Precedence matrix has the number of rows and columns given by the number of elements, among which we monitor the precedence. When inline element passes column element, then the precedence is written to the line and column. In this article, the matrices have size 15x15, fourteen lines (1 – 14] and columns are made up of the region and one row and column (15) indicates the surroundings.

3. Calculation of the multiple precedence

The relationships captured by precedence are successively analyzed by using pVR of the matrixes. Based on the pVRs there is detected a sequence of regions where is no decrease respectively non-growing values varions of monitored communications. The precedens of vary length are monitored and there is found maximal precedence. Thus we can define multiple precedence so-called precedence of different lengths. Multiple precedence shall be entered (or calculated) using by the pVRs precedence.

There was successively calculated pVRs precedence matrices to each monitored variables and investigated the number of the precedence appropriate length. To calculate the pVRs precedence matrix is normally used binary multiplication, where the columns of the resulting matrix are created by the unification operation. This operation is performed above the set of the vectors of the precedence matrix, which are successively selected by selection of the vectors. The selected vectors are used successively as each column of precedence matrix or the pVRs [2]. In MS Excel, it is possible modify the operation of binary multiplication by using two steps. In the first step, it is necesary to do classical multiplication operation (matrix 5, matrix 8, etc.)), in the second step it is important to convert this matrix to bingy matrix using "= IF (value_aij> 0, 1, 0)". Classical precedence matrix is able to obtain by eliminating zero values (Figure 4, matrix 6, matrix 8, etc.). For each matrices pVRs were created auxiliary numerical matrices (matrix 7, matrix 10, etc.) in which is indicated precedence and its duration.

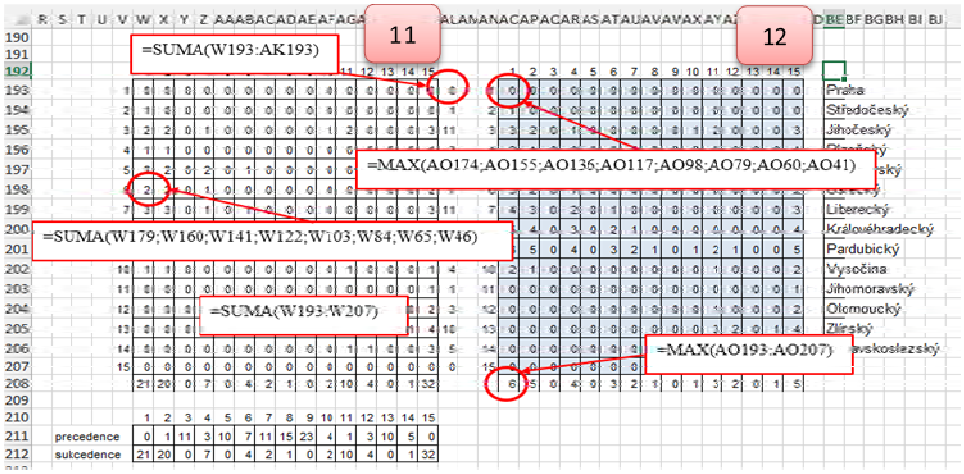
Fig. 4 Calculation of matrix elements



Source: own, using MS Excel (Czech localization)

By summarization of the precedence matrices and their pVRs were calculated the total number of precedencies and consequent for all regions and surroundings (Figure 5, matrix 11). By finding the maxima of the other numerical matrices for individual matrix elements there were obtained multiple precedence matrixes for each region. The overall analysis involves the creation of the common incidence matrix, three matrixes for setting the first precedence and symmetry control data and three matrices for the calculation of each pVRs and its summarization. According to the system size and the number of non-zero pVRs of the matrices, the number of the matrices of acyclic systems ranges for this type of analysis around (3k +1) for each investigated value, where „k" is the number of nodes in the system, in this particular example it is about 120 matrices. The advantage is possible algorithm that reduces the number of basic operations to 3. Those are the calculation of the first precedence, the multiplication of matrices and the transfer of pVRs of matrices to binary matrix. The resulting figures show the rate of change of the individual categories of communications among individual regions. The more precedence individual region consists, the greater is relative increase (or smaller decrease) of values of the quantity due to the surrounding regions. The following figure (Figure 6) shows the difference precedent matrices describing the precedence of I. to III. classes.

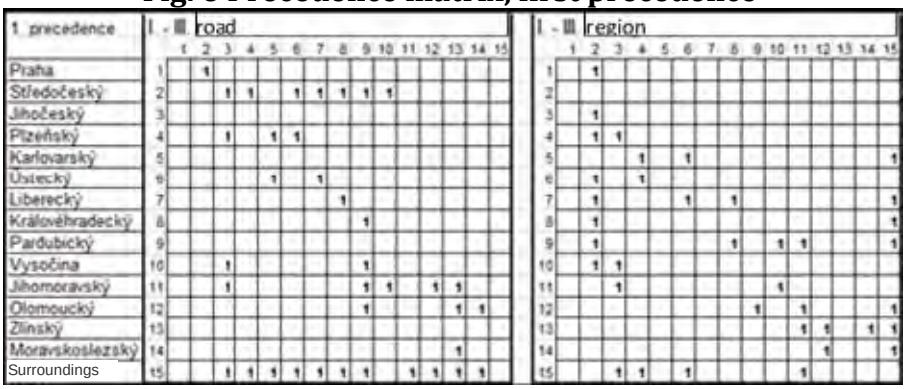
Fig. 5 summarization of Precedence



Source: own, using MS Excel (Czech localization)

According to the number of precedencies of the element we can examine the "strength" of impact of the value to the immediate enviroment (the more have the element first precedencies the more is "dominant" in the selected are). Multiple precedencies shows system paths among the elements with increasing (decreasing) value of studied variable. In other words, we can determine the distance of variable which has impact around its surroundigs.

Fig. 6 Precedence matrix, first precedence



Note: The names of regions in the Czech language

Source: own

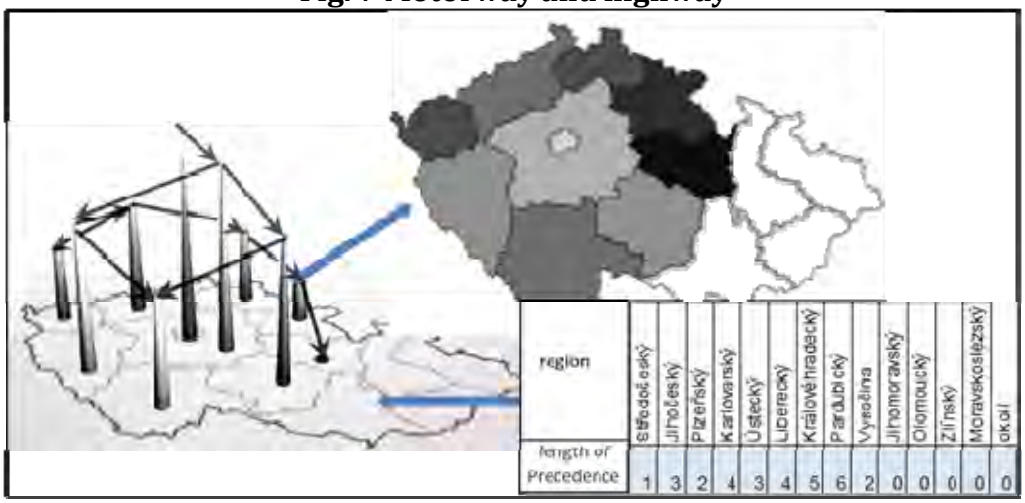
To demonstrate the results of the methods were appropriate precedence displayed by using maps. In the maps the shades express precedence of different lengths, each lighter shade means less precedence. That the region is precedent for another, means it has smaller percentage of that type of communication shown in the map.

4. Evaluation of analysis

Analysis results are fairly widely applicable to different areas of practice, both in terms of availability analysis for example same in terms of coverage of the regions by individual types of communication or tracing still unclear links in the infrastructure.

Based on the documents from precedece matrices were created 56 maps. For each of the county (14) there are 4 maps. The meaning of those maps is the combination of two qualitative parametrs (M+H, I. – III.) and two quantified parameters (percent of assets for the county, the sum of percentages for communication). Into the individual maps were entered routes where is the decreasing value of qualitative parameters of the quantifiable parameter. The following figure graphically shows the precedence of the county of Prague.

Fig. 7 Motorway and highway



Note: Prague, Percent of the length of all roads in Prague, the names of the regions are in Czech

Source: own

The calculated multipled precedence was recorded by using the graph. In the chart for clarity has been a modified precedence value as follows. Maximum precedence was assigned to pursue region (Prague). Regions with precedence were assigned a value of "max (existing_predence) – precedence (region)". In this graph it can clearly trace the paths with decreasing number of the precedence. In practice, these paths show the way to a steady decline in the communications according to the criteria. On the basis of these graphs were created maps, in which marked decreases have progressively darker shades.

Among quite interesting findings include, for example, that Prague has a curl around the Central Czech region, which has all types of communications higher values, thus it acts as a barrier. Exception is the length of M+H in relation to the total length of roads in the region. In this case, the Central Bohemian region has lower value so it is precedent. This allows the passage of others, multiple precedencies. Figure 7 show that the second precedencies copy major highways (Brno, Pilsen). An interesting finding is the fact that the scope of precedence is at M+H focused solely on the Czech regions and it does not

overlap among the Moravian regions. In general, from maps it is possible to trace a strong dominance of the Central and Southern Czech regions in all types of analyzes. This dominance is quite strictly segmented to the southeast of the Republic of South Moravian region (Figure 8, Map 1) and the Central Bohemia region (Figure 8, Map 2), where the precedencies M+H are due to the length of roads in the regions.

Fig. 8 Dominance of the regions

Source: own

Dominance of the Central Bohemian region is also evident in other comparisons. For example the analysis of I. – III. categories in proportion to the total length of roads in the country, it is clear routing of precedence in Moravian regions and it is seen unflattering situation of Moravian and Zlín regions (darkest color is the longest precedence).

Fig. 9 Similarities in the precedence

Source: own

The comparison of I. to III. class to the total length of roads in the region contains the regions Královehradecko (Figure 9, map 4) and Pardubice region (map 5) comparable by heading of precedence to the Czech regions with precedence Prague – Central Bohemian region – Pilsen region – Ústí region – Liberec region. If we evaluate class I to III. class to the total length of the type of communications in the country, then the region Královehradecko (map 6) is more akin to the region of Vysočina (map 7) routing to precedence of Moravian-Silesian regions.

Fig. 10 precedence and highway corridor

Source: own

In the analysis of highways´ lenght due to the length of the whole country is Moravian-Silesian region predecessor of Olomouc region (map 8), however, if we add to highways

speed routes, then the situation is reversed (Map 9 and 10). Dominance of D1 and D5 (Figure 10, lack of precedence) is obvious.

These comparisons are made to demonstrate the methods and overall evaluation is beyond the scope of this article. The results will be published in a separate monograph[1].

Conclusion

The article shows the possibility of precedence analysis. It is obvious that this method of analysis can be used to monitor the intensity and extent of the changes of a quantity. Intensity is measured by the number of precedencies; the extent is measured by the degree of precedence. The method works with binary matricesa and resulting operations are binary matrices. Precedence matrices for multiplication are defined operations that specify the same length among the same elements of precedence existence, not frequency. The Method shows the existence of the precedence (not the frequency of precedence of the same length among the two regions). Therefore, in practice it is appropriate expand the method to detection of the frequency of precedence which can be achieved by the classical (non-binary) matrix multiplication precedence.This contribution shows the possibility of matrix case analysis in the analysis of regional transport infrastructure. It shows relatively large variation of the method, in particular the ability how to easily define the system, change links in the system by simply binding transcription incidence matrix, analyze various large systems, define the sensitivity of the enviroment, etc. The variability is dictated by the choice of links, where the method can be easily modified, whether the linkage is defined by boundary, border crossing or physical connection to the type of communication, etc. The method is focused on examining two types of tasks, we can analyze the intensity ofchanges of the variables in the immediate vicinity or scope of the changes in distant surroundings. Precedence analysis has more options which were not mentioned due to small space, such as the analysis of flow in loops in detecting cycles in a system or detection boundary flows, etc. [8]

Acknowledgements

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[1] SGS 5/2013 OPF SU

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Transport Infrastructure as a Factor of Competitiveness Moravian-Silesian Region

Abstract

The Czech Republic in their strategic objectives outlined the materials placed in 2020, among the twenty competitive economies in the world. Competitiveness as other economies determined on the basis of criteria and basically goes in the direction of today's understanding of competitiveness, ie to be a region that teaches, creates a favorable climate and promote innovation. To create a competitively capable region is one of the conditions such as skilled labor, cultural background, education and quality of transport infrastructure.

To the Czech Republic to achieve the strategic goals of competitiveness, should exert efforts to create a quality transport system at all levels of territorial units, which will contribute to reducing disparities between regions and increase they attractiveness. Moravian-Silesian region has considerable influence of transport infrastructure development in recent years is sufficiently dense transport infrastructure in proportion to the size, in terms of population is below average, to a greater extent inadequate. Transportation routes are inadequate capacity, routes are maintained throughout the towns and villages.

The need for investment is hampered by lack of financial resources, which are often used inefficiently. For these reasons it was decided to adopt new approaches such as in the evaluation of the merits of highway construction, new instruments and creating centers of research related to research complex traffic issues, which are a possible solution for the creation of sustainable, safe and environmentally friendly transport.

Key Words

competitiveness, density, traffic, infrastructure, highways, infrastructure, road density

JEL Classification:. O18, L99

Introduction

The Czech Republic in their strategic objectives outlined the materials placed in 2020, among the twenty competitive economies in the world. Competitiveness as other economies determined on the basis of criteria and basically goes in the direction of today's understanding of competitiveness, it means being a region that is able to learn, to create a favorable climate and promote innovation [4]. To create a competitive region is one of the conditions such as skilled labor, cultural background, education and quality of transport infrastructure.

It follows that the Czech Republic (the Czech Republic) would achieve the strategic goals of competitiveness should develop efforts to create a quality transport system at all levels of territorial units, which will contribute to reducing disparities between regions and increase their attractiveness and the attractiveness of the Czech Republic. Research is conducted under a grant SGS 5/2013 OPF SU.

1. Transport infrastructure as a determinant of competitiveness

As a source of competitiveness are understood knowledge, ability to learn and create a cultural climate that is conducive to innovation. Today's strategic materials talking about having to create learning regions and the development of innovative potential. Innovative regional growth is influenced by Maier and Tödtlinga [5], a highly skilled labor force, local universities and research institutes, a sufficient number of suppliers and subcontractors of various components, the extent of the market and easy access to the market, technical infrastructure, especially transport networks, access to capital, legal framework conducive to innovation (particularly in the area of intellectual property), cultural environment for creating conditions attractive lifestyles and forms of interaction between the various actors in the innovation system networks.

By definition, it is clear that transport infrastructure plays in the evaluation and development of competitiveness an important role. Characteristics that contribute to increasing the competitiveness of the regions described, for example in [6], [7], [9], [10].

Competitiveness of the regions based on the evaluation of transport infrastructure can be measured by a number of criteria and indicators. Most models used as benchmarks economic situation, educational potential, business climate, environment, and etc.

One of the possible assessment of the competitiveness of transport infrastructure is a Japanese model that is based on the evaluation of socio-economic data1. It is based on the division evaluated the determinants of competitiveness in the categories: (1) internationalization (2) businesses, (3) education, (4) finance (5) state government (or government), (6) science and technology, (7) infrastructure and (8) information technology. Determinants of competitiveness of transport infrastructure then defined based on the following criteria:

1. Aircraft departures per capita.
2. Containers per capita.
3. Ratio of power transmission/distribution loos.
4. Ratio of paved routes.

[1] The Japanese approach, that is based on an examination of socio-economic data, not on the basis of management research.

This model provides compared to other models real competitiveness is a look at the potential competitiveness, which is based on the measurement of the basis for future competitiveness, not as a result of economic growth.

Another way to evaluate the competitiveness, if we include transport infrastructure, the quality of life index, which is based on the evaluation of the nine categories[1] and weights. Evaluation of the competitiveness of infrastructure with the balance 10 % is based on the evaluation of the length of the railway network, highways and navigable rivers in the ratio of population and area. Even the integration of transport infrastructure in the individual evaluation models is considered to be the development of transport networks to create an indispensable conditions for competitiveness.

2. Evaluation of the competitiveness of transport infrastructure Moravian-Silesian Region

Despite considerable investment boom transport infrastructure MSR in 2011 ranks among the regions with the highest number of inhabitants per 1 km transport networks (road and rail) (see Table 1), which can cause significant overload capacity, the emergence of congestion and loss of traffic flow and lengthening transport times, increasing logistics costs, etc.

Table 1 shows the sequence of individual regions in the Czech Republic. Values are given as the number of inhabitants per kilometer. A larger value indicates a lower density.

Tab. 1 Rank – population/1km routes 2011

RANK - population/1 km 2011							
Region	roads	highway	roads I. Class	roads R	railway	TOTAL	TOTAL RANK
Prague	14	14	14	10	14	66	1
Central Bohemia Region	4	5	12	5	9	35	8
South Bohemia Region	2	12	1	13	2	30	9
The Plzen Region	3	3	5	1	5	17	13
The Karlovy Vary Region	6	1	7	6	1	21	12
The Usti Region	10	7	9	12	6	44	5
The Liberec Region	9	1	6	7	4	27	10
The Hradec Kralove Region	7	10	4	1	3	25	11
The Pardubice Region	5	13	2	14	8	42	6
The Vysocina Region	1	4	3	1	7	16	14
The South Moravian Region	11	6	13	11	11	52	3
The Olomouc Region	8	8	10	4	10	40	7
The Zlin Region	12	11	8	8	12	51	4
The Moravian-Silesian Region	13	9	11	9	13	55	2

Source: Own processing [1]

[1] I. The cost of living (10%), II. Leisure and culture (10%), III. Economy (15%), IV. Environment (5%), V. Freedom (10%), VI. Healthcare (10%), VII. Infrastructure (10%), VIII. Risk and safety (10%) and IX. Climate (10%)

On the contrary, the density of transport networks in the Moravian-Silesian Region generally below average (see Table 2, in Table 2 shows the density of roads in the area of the region):

Tab. 2 RANK – density 2011 (km/km²)

RANK - density 2011 (km/km²)							
Region	roads	highway	roads I. Class	roads R	railway	TOTAL	TOTAL RANK
Prague	14	1	14	1	1	31	11
Central Bohemia Region	1	3	11	3	8	26	13
South Bohemia Region	10	12	8	11	11	52	1
The Plzen Region	7	4	13	12	12	48	3
The Karlovy Vary Region	9	13	10	4	5	41	6
The Usti Region	4	6	5	9	2	26	13
The Liberec Region	6	13	3	5	3	30	12
The Hradec Kralove Region	2	10	4	12	4	32	9
The Pardubice Region	3	11	2	10	7	33	8
The Vysocina Region	5	5	9	12	13	44	4
The South Moravian Region	11	2	12	8	10	43	5
The Olomouc Region	8	8	7	2	9	34	7
The Zlin Region	13	9	6	7	14	49	2
The Moravian-Silesian Region	12	7	1	6	6	32	9

Source: Own processing [1]

3. Transport infrastructure as an innovative means of competitiveness

Development of transport infrastructure can be seen as one of the innovative tools allowing gain competitiveness in the field of economic activity. In the current era of globalization and consequent competitive pressures companies shifting production to areas with lower costs. Czech Republic, and thus Moravian-Silesian Region, is no longer a place with cheap labor. Therefore, should the creation of competitiveness to take advantage of its strategic transport position. The development of the transport system is a prerequisite for creating a good business environment that allows companies to reduce costs through such continuity of supply, accelerating inventory turnover, etc. Potential investors entering the region are often decided on the basis of relative accessibility, ie. evaluate the quality of accessibility between regions. One of the evaluated factors of regional competitiveness in the economic prosperity the amount of the GDP, indicators of economic activity in the territory of the region. Production performance of the economy MSR was in 2005 after the most powerful capital city of Prague in 2011, however, economic development compared to other regions of the CZ slows and falls on the 4th place (see Table 3). According to the Transport Policy of 2013 – 2020 is to increase the competitiveness and growth of GDP is associated with a positive development of the transport infrastructure of higher order, ie motorways, express roads (road R) and communication first class.

Tab. 3 Inter-regional comparison of GDP in 2005 and 2011

			Share of GDP		RANK GDP	
region	2005	2011	v %	v %	2005	2011
Prague	752091	973094	24,14	25,33	1	1
Central Bohemia Region	318687	411041	10,23	10,70	3	2
South Bohemia Region	172956	196499	5,55	5,12	6	6
The Plzen Region	158755	186167	5,09	4,85	7	7
The Karlovy Vary Region	72351	78666	2,32	2,05	14	14
The Usti Region	206058	242495	6,61	6,31	5	5
The Liberec Region	108262	122256	3,47	3,18	13	13
The Hradec Kralove Region	145111	174701	4,66	4,55	9	10
The Pardubice Region	126270	153224	4,05	3,99	12	12
The Vysocina Region	129975	153750	4,17	4,00	11	11
The South Moravian Region	310623	396083	9,97	10,31	4	3
The Olomouc Region	146368	178815	4,70	4,65	8	9
The Zlin Region	144825	182413	4,65	4,75	10	8
The Moravian-Silesian Region	323726	392166	10,39	10,21	2	4

Source: Own Processing [1]

This fact confirms the relationship between transport networks and economic activity of the regions expressed in GDP (Gross Domestic Product). Only column 5 (Population / Roads Class R) not show the correlation[1].

Tab. 4 Correlation value

	Population / Road	*Density Road*	*Population / Highway*	*Density Highways*	*Population / Roads Class I*	*Density Roads Class I*	*Population / Roads Class R*	*Density Roads Class R*	*Population / Railway*	*Density Railway*
GDP 2011	0,888706539	-0,73231581	0,716833116	0,728985613	0,891045493	-0,53735495	-0,00582447	0,86774988	0,930912866	0,824617817

Source: Own Processing [1]

Based on the data of individual regions in 2011 confirmed a linear relationship ((1), see Tab. 5) between economic variables and density of transport networks, that if there is an increase in the density highway network, network speed communications, and increase the number of inhabitants per 1 km motorway then the increase in GDP within the regions ((1) and Table 6)).

[1] Optimal value of the correlation coefficient for the acctepting linear dependence is r>=0,4 (Chráska [3].

$$GDP = 35036,08 + 2,29 \cdot population / highway + 1,4 \cdot 10^{9} \cdot density\ highway + \\ + 5,5 \cdot 10^{8} \cdot density\ roads\ R \quad (1)$$

Tab. 5 Test regression model

Value of rentability	F-test	Darwin – Watson	Critical F-test
0.93	42.8	1.94	5.4

Source: Own Processing [1]

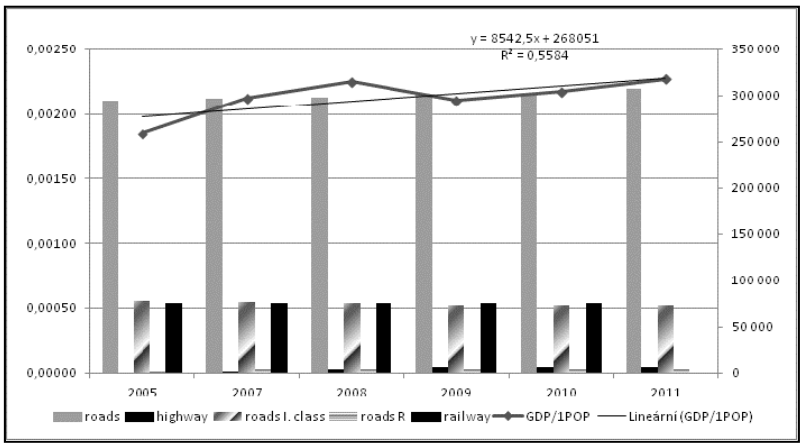
Tab. 6 Regression test

Regression analysis								
Multiple R	0,963215669							
The value of R-squared	0,927784425							
The adjusted R-squared value	0,906119752							
Error AC values	69487,70842		4,2825E+01					
Observation	14	6,8927E+10						
ANOVA								
	Unlike	*SS*	*MS*	*F*	*Significance F*			
Regression	3	6,2034E+11	2,0678E+11	4,2825E+01	5,1542E-06			
Residues	10	4,8285E+10	4,8285E+09					
Altogether	13	6,6863E+11						
	Coefficient	*Error*	*t Stat*	*P- value*	*Lower 95.0%*	*Lower 95.0%*	*Lower 95.0%*	*Lower 95.0%*
Limit β0	35036,08	3,46E+04	1,0139	0,3345	-4,20E+04	1,12E+05	-4,20E+04	1,12E+05
Highway population/km β1	2,29	9,20E-01	2,4897	0,0320	2,41E-01	4,34E+00	2,41E-01	4,34E+00
Density of Highway km/km2 β2	1439601090,22	3,06E+08	4,6998	0,0008	7,57E+08	2,12E+09	7,57E+08	2,12E+09
Density of road R km/km2x β3	550000568,58	1,87E+08	2,9362	0,0149	1,33E+08	9,67E+08	1,33E+08	9,67E+08

Source: Own Processing [1]

According to the graph, it is clear that the development of road and rail networks GHP copying D (see Figure 1). Linear relationship is not acknowledged between population density per kilometer of transport route Moravian-Silesian Region and the level achieved GDP. If the density of transport networks also showed no linear association with the development of GDP. Cannot be unambiguously speak of a linear relationship Moravian transport system with the performance of the economy during the period 2005 to 2011.

Fig. 11 Development of GDP and the structure of the road network in the years 2005 – 2011



Source: Own processing [1]

Conclusion

Based on the result, it was confirmed that the relationship and structure of GDP measured in terms of network traffic according to density per km2 and population / km transport route exists and as stated in the strategic material is linked to the economic potential of transport pathways in higher grades. It has been confirmed that it is not possible to measure the performance of production and transportation routes only at a regional level, but to deal with the complex in the Czech Republic, and prevent that in consequence of regional lobby not to increase the differences in equipment transport networks between regions, not to promote the development of transport infrastructure in regions at the expense of other regions [2].

A good approach is to adopt a new evaluation method, which based on multi-criteria decision-making should be assessed individual factors from the economic, security, environmental character. On the basis of brainstorming are weights assigned to individual factors and then scored level factors experts from a wide sphere of scientific and technical skills [8]. This method jointly by the CBA will bring another tool to improve the development of transport infrastructure

Since you cannot separate the development of road and rail routes from other modalities and create an open transport system should be innovation in transport infrastructure be directed to:

1. Linking transport system across regions and Europe.
2. Creating a transport system and to contribute to intermobilitě.
3. Support improvements in safety standards for roads to improve the quality of transport processes.
4. Support the introduction of new technologies, materials and diagnostic methods for construction and renovation projects of transport infrastructure.

The need for research and innovation led to the need to apply research within the Centre of research related to research complex traffic issues for a sustainable, safe and environmentally friendly and competitive transport.

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Comparative Analysis of Innovative Activities in the Czech Republic According to Selected Innovative Indices

Abstract

Policy of the European Union is focused on the fast growing innovative companies which quickly respond to market demands and consequently increase its competitiveness. To meet those objectives companies need the right conditions and support of their state. However, companies are not able to increase the innovative efficiency without the help and support of broader National innovative scheme. Also, there are important requirements for National innovative system to function well. Those are well balanced improvements of an individuals and subsystems during all phases of the innovative process. This is because innovation is not the domain of a single entity but it is the result of the continuous interaction between the various elements of the national innovative system. Therefore, the universities, research organizations as well as companies and their suppliers and customers (customers) all play an important part in the innovative process. However, some of the important factors are also the quality of an institution and the environment where the innovative process is carried out. These all are the main reasons for the establishment of the national innovative strategy in developing countries. National Innovative Strategy builds on the recommendations of the European Union's innovative strategy document, to support Member States in innovative activities.

Feedback to evaluate the strategic objectives that were set out in the national innovative strategy can give composite indicators. The aim of this document is to evaluate the current position of the Czech Republic in the area of the science, research and innovation through selected indices.

Key Words

innovation, strategy, innovative policy, indices

JEL Classification: O31,O38, O57, R11

Introduction

Businesses that want to maintain and improve their market position, must constantly seek opportunities for their innovation. Sufficient innovation (or innovative performance) enables enterprises localized in developed countries to succeed in goods and services in an increasingly interconnected world markets where they face strong competition from other developing economies. Innovative companies which want to carry out their innovative activities and enhance their performance need the right conditions and support from the state. Innovative performance is not only the ability of businesses, but is also tied to the broader environment around the national innovation

system. The system includes both public and private institutions whose activities and interactions provide various aspects of the innovation process, which are the creation, transmission and application of new knowledge. The important prerequisite for a well-functioning national innovation system is the balanced development of individual actors and subsystems at all stages because innovation is not the domain of a single entity but rather are the result of the continuous interaction between the elements of the national innovative system. Important role in the innovative process therefore will not be played only by universities and research organizations, but also by companies and their suppliers and customers (customers), and finally the quality of institutions and the environment in which the innovative process is carried out. Those are the main reasons for the establishment of the national innovative strategy in developing countries. National Innovative Strategy builds on the recommendations of the European Union's innovative strategy document, to support their member states in innovative activities based on knowledge, excellent research, and quality education and training for professionals, but also on innovative activities carried out by industry.

1. Innovative policy of the Europe Union

The Innovative Policy of the European Union is focused on the fast growing innovative companies that can respond quickly to market demands and to increase their competitiveness. Investment in research and development (R & D) is a key element in the promotion of innovative ideas and subsequent economic growth. For these reasons, increasing investment in R & D has become one of the objectives of Europe 2020. This strategy was approved by the European Commission and it is followed by the Lisbon strategy. It contains three basic areas: knowledge, empowerment of citizens in society and sustainable growth. One of the main objectives of the Europe 2020 strategy is the innovative program. To achieve this, an agenda called "European Innovation Union" was established. Its aim is to focus on research and development (R & D) and innovative activities with the intention to close the gap between science and the market. In April 2011, members of EU have set the new targets in their National Reform Programme with regard to the Europe 2020 strategy. EU set itself a new goal in science, research and innovation to increase investment in R & D up to 3 % of GDP and the level of tertiary education up to 40 %. A goal set for the Czech Republic is to increase R & D spending up to 1 % in the public sector. For the innovative policy to function properly, it is essential to create appropriate institutional framework which clearly defines roles and allocates the necessary competencies. It is crucial to establish the key responsibilities between the individual elements of the innovative strategy.

2. National Innovative Policy

The state's role in innovative policy is to promote the networking and structures between the different actors of the innovative process, strengthen the interaction between them, drive effective cooperation and transfer information between all stakeholders in the innovative process. Lundvall sees a distinction between wide and narrow definition of national innovative system. According to the narrow definition, NSI

consists of organizations and institutions which is engaged in exploration and research and includes services such as research and development, technological institutes and universities "[4]. According to the wide definition of NSI ... "are defined elements and which relationships involved in the creation, diffusion and use of new and economically useful knowledge" [4]. Freeman defines a national system of (NSI) as a network of institutions in the public and private sectors whose activities are to encourage, import and to modify and extend the new technology. The authors exploring the national innovative process are usually focused on the structure of a research studies, its performance and development, the evaluation of a quality education systems, the cooperation between industry and universities, the availability of financial instruments to support innovation, etc. [1] The prerequisite of a functional innovative policy is to put in place appropriate institutional framework which clearly defines roles and allocates the necessary competencies. Therefore, the Czech Republic has created a new National Innovative Strategy (NIS) for the period of 2010 – 2020. Its purpose is to increase competitiveness and to emphasize the importance of innovative firms and innovative entrepreneurship in the economy. Following that, NIS has created International Competitiveness Strategy of the Czech Republic for the period of 2012 – 2020 and the Innovative Union Document. NIS is a strategic document with the same objectives of the National Policy, Research, Development and Innovation (hereinafter referred to as "NP & I"). Successful implementation of innovative policy is a matter of coordination together with a consistent partial policies and also social consensus within a single strategy. These conditions could meet the current strategy of the International Competitiveness Strategy of the Czech Republic. The foundation of a strategic approach to innovation is a link between all the pillars of the knowledge triangle, the development of a human resources and achievement of the knowledge and innovative activities. The aim of the effective innovative policy is the balanced development of the three pillars of the knowledge economy which contribute to the strengthening of knowledge production, their use in innovation and the development of knowledge and skills in the population. On the other hand, just a one-sided emphasis on one or two areas of the knowledge triangle cannot provide a sufficiently efficient formation, transmission and utilization of knowledge for the development of economic competitiveness and a quality of life in society. Particular emphasis in the development and implementation of innovative policies should be put on the even strengthening in the supply of a new knowledge and a demand for such knowledge. The public sector, as a user (client) of a new knowledge should be more prominent in a role of an innovative solutions and knowledge expansion.

3. The Score of innovative position of the Czech Republic by selected international indices

International comparison of the innovative environment and innovative performance is carried out by the various international indices. This contribution, which aims to evaluate innovative performance of the Czech Republic uses following indices:

- Summary innovative Index (SII)
- Global Competitiveness Index (GCI)
- IMD Competitiveness Index.

3.1 Summary innovative index (SII)

The evaluation system called European Innovative Scoreboard was developed with the purpose to compare an innovative position and progress of the European Union and its members with the rest of the world and to evaluate their latest trends. The main tool for international comparisons of innovative environment and innovation performance of EU countries is a summary innovative index (SII) which was compiled annually since 2001. The sub-indicators and methodology for the summary innovative index calculation has changed during the years, this is why, it is only possible to evaluate the position of the Czech Republic with other monitored countries. Since 2010, the new methodology SII which is composed of 25 quantitative indicators, of which only 12 indicators remain the same, compared to the previous period. The indicators are grouped into eight categories: innovative inputs (human, knowledge and external resources), business activities (internal investment companies, innovative collaboration, entrepreneurship and protection of industrial property) and innovative outputs.

According to the Scoreboard, Research and Innovative Union 2011, Member States are divided into four groups:

- The performance of Denmark, Finland, Germany and Sweden is well above that of the EU27 average. These countries are the ***"Innovative leaders"***.
- Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK all show a performance close to that of the EU27 average. These countries are the "***Innovative followers".***
- The performance of Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain is below that of the EU27 average. These countries are „***Moderate innovators".***
- The performance of Bulgaria, Latvia, Lithuania and Romania is well below that of the EU27 average. These countries are „***Modest innovators".*** [9]

Czech Republic is one of the moderate innovators with a below average performance. Relative strengths are in Human resources, Innovators and Economic effects. Relative weaknesses are in Open, excellent and attractive research systems, Finance and support and Intellectual assets.[1]

Tab. 1 Summary Innovative Index (SII) time series

Summary innovative index (SII)	2007	2008	2009	2010	2011
EU	0.52	0.53	0.53	0.53	0.54
CR	0.4	0.4	0.38	0.4	0.43
CH	0.78	0.81	0.82	0.82	0.83

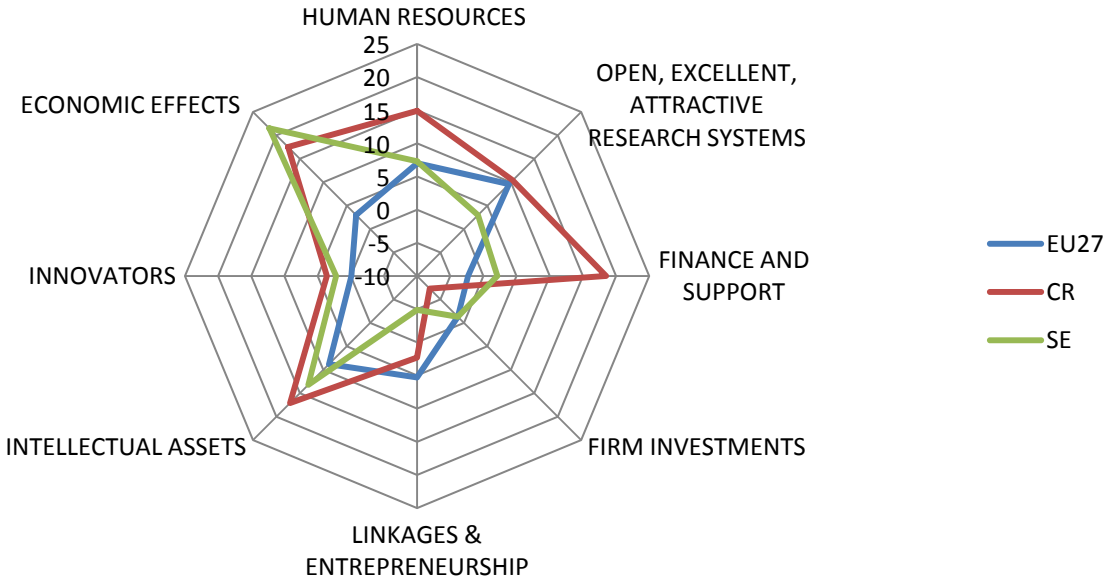
Source: own based on [9]

The fig. 1 shows the average annual change in the major indexes, which is calculated indicator SII. The graph shows the average annual change in the CR compared with

[1] http://www.proinno-europe.eu/inno-metrics/page/country-profiles-czech-repucblic

Switzerland and EU27. Switzerland was chosen because it achieves the best position to evaluate and ranks among the leaders in innovation.

Fig. 1 Annual average growth per indicator and average country growth (2011)



Source: own

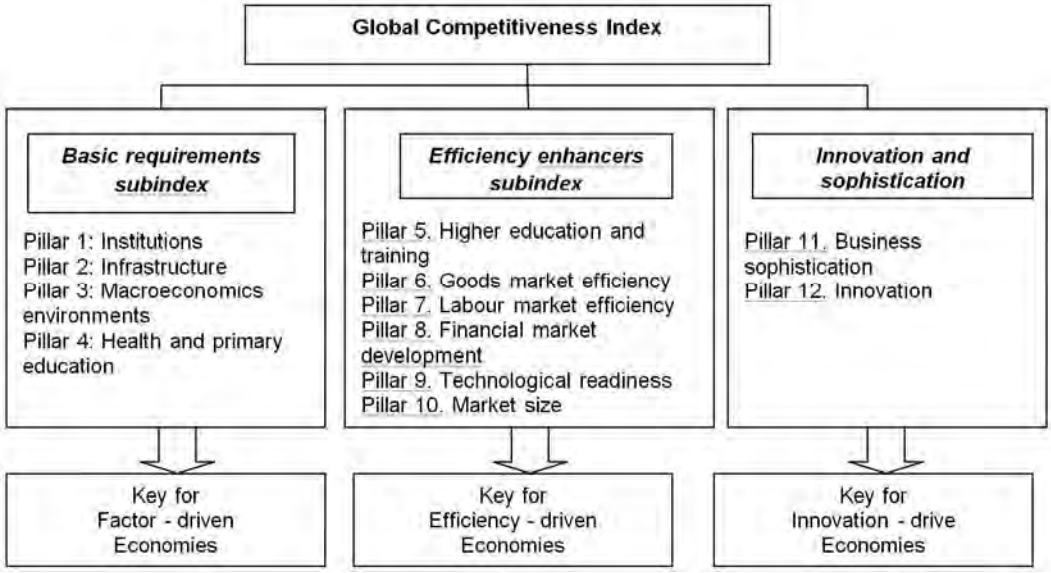
By international comparison of overall innovative performance of the Czech Republic remains below the EU-27, however, the ability to take advantage of economic benefits of innovation is deluxe. The main shortcomings of the innovative environment include low availability of financial resources for innovation (especially in venture capital) and small industrial use and legal protection. The data document "Analysis of research, development and innovation in the Czech Republic and their comparison with foreign countries in 2011" shows that competitiveness (innovative performance) CR is mainly driven by innovative activities of firms while the quality of the institutional environment is likely to be reduced.[1]

3.2 Global Competitiveness Index (GCI)

For more than three decades, the World Economic Forum's annual Global Competitiveness Reports have studied and benchmarked the many factors underpinning national competitiveness. From the onset, the goal has been to provide insight and stimulate the discussion among all stakeholders on the best strategies and policies to help countries to overcome the obstacles to improving competitiveness. The concept of competitiveness thus involves static and dynamic components. These components are grouped into 12 pillars of competitiveness (see Figure 2). [5]

[1] http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf

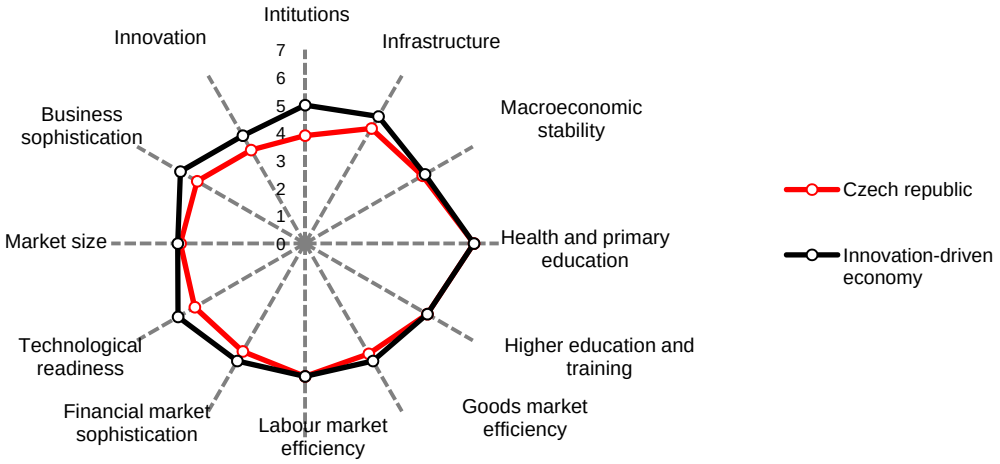
Fig. 2 The Global Competitiveness Index framework



Source: [5]

Innovation can emerge from new technological and no technological knowledge. Non-technological innovations are closely related to the know-how, skills, and working conditions that are embedded in organizations and are therefore largely covered by the eleventh pillar of the GCI. The final pillar of competitiveness focuses on technological innovation.

Fig. 3 Global Competitiveness Index (GCI) 2010-2011



Source: [5]

Tab. 2 The 12th pillar: Innovation (GCI) 2012

12th pillar: Innovation (GCI) 2012	CR	CR rank	CH	CH rank
Capacity for innovation	4.1	22.	5.8	2.
Quality of scientific research institutions	4.9	26.	6.3	2.
Company spending on R&D	3.9	28.	5.9	1.
University-industry collaboration in R&D	4.5	28.	5.9	1.
Gov't procurement of advanced tech products	2.9	122.	4.3	22.
Availability of scientists and engineers	4.5	43.	5.1	14.
PCT patents, applications/million pop.*	18.4	28.	287.2	2.

Source: [5]

In 2012, the Czech Republic (CR) was ranked in the GCI ranking score at the 39th site. In the 12th Pillar Innovations the CR is doing well as it is ranked at 32nd place out of 144 countries. According to this, the pillar significantly outperforms other new member states which conversely overtake the Czech Republic under the first pillar of the GCI – the quality of institutions. The table shows the results of the various factors in a pillar of innovation for the Czech Republic and Switzerland (CH). The values range from 1 to 7). From these areas the Czech Republic has the worst rating in the Government procurement of advanced tech products indicator which amounted 122nd position. On the other hand, The Czech republic was positioned 22nd place at the pointer Capacity for innovation. In the comparison of values between the Czech Republic and Switzerland, there is the biggest difference in the protection of intellectual and industrial property. Switzerland reaches fifteen times higher rates than the CR.

GCI indicator assesses the Czech Republic in relatively better way than the index SII. It positively evaluates the business and technological advancement, the quality of higher education, the ability to innovate and the availability of the research projects and training services. However, the negative aspects are also evaluated: these are the cooperation among private sector and universities, patent applications and procurement of advanced technology, the lack of transparency in government policy, the embezzlement of funds and confidence in the political situation. Czech Republic is behind its "innovative system" and should proceed to its reformation. Same as in the classification of SII index, The Switzerland together with the Nordic countries such as Sweden, Finland and Denmark recognize the national competitiveness as one of the essential requirements in maintaining the high standard of living and their future prosperity. Therefore, these countries have built a system which is able to support innovative companies by linking them with the risk capital. This is the reason why the innovative companies have the necessary financial resources in order to establish themselves in foreign markets before their competitors. Their system includes a network of foreign agencies operating in the export promotion and supports these countries.

3.3 IMD competitiveness index

Another respected aggregates IMD competitiveness index is composed of nearly 330 quantitative and qualitative indicators, which reflect the competitiveness of the 4 dimensions – economic performance, government efficiency, business efficiency and infrastructure sector.

The World Competitiveness Scoreboard presents the 2012 overall rankings for the 59 economies covered by the WCY. [10]

Tab. 3 Position of the Czech Republic in international comparison of IMD index time series in 2012

Czech republic/WCS rank	2008	2009	2010	2011	2012
IMD competitivenes index	28.	29.	29.	30.	33.
Economic Performance (78 criteria)	20.	25.	29.	34.	29.
Government Efficiency (70 criteria)	33.	31.	33.	28.	30.
Business Efficiency (67 criteria)	34.	36.	40.	35.	41.
Infrastructure (114 criteria)	24.	25.	26.	29.	30.

Source: [5]

Since 2008, the position of the Czech Republic's in the international comparison of IMD index is kept around 30th partitions and stays unchanged. In 2012, the Czech Republic was ranked the 33rd place out of 58 compared countries and in 2008, achieved the 28th place.[10]

In terms of individual group of factors, the availability of basic infrastructure, a relatively stable currency, a price levels and successful participation in international trade are amongst some of the relative strengths of the Czech Republic. However, according to the IMD, the main weakness is seen in the lack of necessary economic and social reforms produced by the government together with a difficult access of businesses to the external financial market resources.

Conclusion

In terms of science, research and innovation, it is an equal and harmonized approach which enables the reasonable comparison and correct measurement of the individual countries against their competitors. Also, it helps to identify the specific areas of their excellence and reserves. The information obtained is then used to create innovative reforms in individual countries helps them to establish and achieve a common strategic objectives in a line with the Europe 2020 strategy created in the EU preceded by the Treaty of Lisbon.

This document deals with an evaluation of innovative activities in the Czech Republic using the composite indicator Summary Innovative Index, the Global Innovative Index and IMD index.

The final position of the Czech Republic in the field of innovative performance is still below the European average but there is a trend of gradual convergence to the average innovative performance of the EU-27. However, the innovative performance and competitiveness of the country slows down inefficient management of public funds, excessive bureaucracy and poor political environment. This is clear from the international comparisons of WEF. Arising from the international comparison, the most evident limitation of the Czech innovative system is a relatively lower availability to financial resources and skilled workforce with the appropriate requirements for the development of innovative economic performance. Lack of innovation is also the number of entities that use legal forms of intellectual property protection. In the area of R & D the Czech Republic suffers with research activities support and ability to use venture capital to support individual firms with these activities. Compare to EU-27, the Czech Republic is also below average rate in using public resources spending on research and development. The communication and cooperation of the innovative system is also assessed as very weak. A little emphasis is placed at the return of investments and commercialization as the results of scientific research supported projects. Positive side of CR is the export of the high technology with the results achieving above-average. This is primarily due to the structure and openness of the Czech economy market. One of the tools for improving the environment in the area of science, research and innovation and which was also successfully used in many countries is so-called "Foresight". In Czech conditions, this is a completely new service provided by a state with the purpose to successfully identify technology areas of strategic importance. Foresight as an open system for the collection, evaluation and processing signals for strategic decision-making would enable The Czech republic to provide businesses with relevant information on new requirements, key technologies, changing markets, new sectors and new trends.

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Measurement of Financial Literacy: Case Study from Latvia

Abstract

The ability to establish financial goals and to develop strategies for ensuring long-term economic stability are critical factors in attaining economic success for any individual. The authors examine existing experience with regard to evaluation of financial literacy level in order to develop own approach to the assessment of the financial literacy of Latvian citizens. The results represent the pilot study of the level of financial literacy conducted by authors in February 2013 within the framework of the research project «Enhancing Latvian Citizens' Securitability through Development of the Financial Literacy» implemented at Riga Technical University. The methods chosen for conducting the research were: literature review and analysis, questionnaire method. The pilot study revealed great interest of respondents of different age and social position to financial literacy issues.

Key Words

financial literacy, measurement, method

JEL Classification: **D10, D12, D14**

Introduction

The global financial crisis and financial stability issues of the Eurozone countries have demonstrated that financial literacy of the population that provides people with the opportunity to make informed and efficient decisions is of utmost importance. Focusing on the main economic concepts has been recognised as one of the most efficient approaches in developing financial literacy. In line with the globally accepted practices, a programme aimed at educating people on the issues of personal finance management and the development of financial literacy was launched in Latvia in 2010. Experts recognise that the level of consumer financial literacy is insufficient. It is manifested as problems associated with credit card use [19], meeting financial liabilities [16], stock market participation [15], inability to accumulate wealth and effectively manage it [22], and insufficient planning in retirement wealth accumulation [16]. Conceptual Model of Financial Literacy [12] included interaction among Financial Knowledge, Financial Skills, Perceived Knowledge and Financial Behaviour. As practical application of knowledge and skills is important in making financial decisions, the issue how to evaluate certain components of financial competence and to measure financial literacy on the whole becomes particularly topical.

1. Existing Experience in Financial Literacy Measurement

Marcolin and Abraham [18] identified the need for research focused specifically on measurement of financial literacy. Typically, financial literacy and/or financial knowledge indicators are used as inputs to model the need for financial education and explain variation in financial outcomes such as savings, investing and debt behaviour [13]. That is why in the studies on the measurement of the level of financial literacy different authors consider: 1) the issues associated with retirement wealth accumulation [1, 14]; 2) evidence and implications for financial education programmes [15, 17]; 3) the link between wealth accumulation and financial literacy [4]; 4) the interconnection between financial crisis, debt behaviour and financial literacy [16]. In order to determine the financial literacy of an individual, the researchers use questionnaires, which comprise questions that allow determining numerical ability, economic literacy and cognitive ability of the individual [7, 15]. If a person has poor knowledge in mathematics, s/he does not deal with financial issues or, in case s/he gets involved with financial matters, s/he does not choose the appropriate product, as s/he is not able to compare financial products. Another problem is that people do not reconsider the products after they have bought them, so that they could switch to other, more cost-effective offers [20].

There are studies, which provide the reference to Health and Retirement Study (HRS) [1, 4, 6, 9, 10 14, 25]. The module includes questions that measure how workers make their saving decisions, how they collect the information for making these decisions, and whether they possess the financial literacy needed to make these decisions.

It is not possible to use the questionnaires applied by other researchers (Tab. 1) in respective studies to investigate the situation in Latvia due to several reasons:

1. the content of the questionnaires is not relevant for analysing economic reality in Latvia;
2. the questions are mainly aimed at testing relatively elementary arithmetic knowledge, that is the reason why the measurement of the respondent's set of Financial Knowledge, Financial Skills, Perceived Knowledge and Financial Behaviour is not carried out;
3. the questionnaires comprise questions on financial products and instruments that are not available in Latvia.

Tab. 1 Approach of Measuring Financial Literacy

Aim of the analysis	Authors	Demographic char. and socioecon. attr.	Issues addressed in the questionnaires
Explores the hypothesis that poor planning may be the primary result of financial illiteracy.	Lusardi, Mitchell 2005	Race, Age, Gender, Education	Health and Retirement Study (HRS) Module (Interest Rate, Inflation, Risk Diversification)
How variations in financial literacy (knowledge) and effort vary in the population, study the acquisition of financial knowledge in the context of human capital framework.	Delavande, Rohwedder, Willis 2008	Age, Education, Gender, Income	Twenty-five questions on financial sophistication, detailed measures of income, wealth and portfolio allocation plus measures of risk tolerance, self-assessed financial knowledge, use of records and other sources of information and several questions on decision making
To examine how characteristics, such as income, education, investment experience, and financial literacy influence how workers view investment funds	Hastings, Tejeda-Ashton 2008	Age, Education, Gender, Monthly Salary, Account Balance, Marital Status, Number of Children, Internet Access, and Internet Usage, Employment Status in the Formal Sector, Employment Title	Health and Retirement Study (HRS) Module 8 on Retirement Planning (2004)
To study how portfolio diversification correlates with financial literacy and other investors' characteristics	Guiso,Jappelli 2008	Age, Education, Occupation, Income Level, Wealth Accumulation	Portfolio diversification (financial literacy, perceived financial sophistication, financial ability, risk aversion)
Assessing a more direct link between financial literacy education and financial decision making	Mandell Klein 2009	Students (educational attainment)	Current level of financial literacy, financial behaviour and attitude toward risk
It would be useful to know if subprime borrowers were disproportionately drawn from the low debt literacy groups.	Lusardi,Tufano, 2009	Age, Gender, Race, Ethnicity, Marital Status, Employment, Region of Residence, Family Size, Type, Income, Wealth	Questions to assess key debt literacy concepts, interest rates and comparisons of alternatives, financial investments, financial transactions
Financial literacy among Australian business students can be explained by gender	Wagland, Taylor, 2009	Gender, Age, Working Experience, Work Experience, Academic Achievement Grade, Student Status, Year of Studies	49 questions, knowledge of personal finance; understanding of financial terms and concepts; the skill to utilize both knowledge and understanding to make beneficial financial decisions
To explore the mechanism that underlies the robust relation found in the literature between cognitive ability, and in particular numeracy, and wealth, income constant.	Gustman, SteinmeierTabatabai, 2010	Age 51 to 56 in 2004, Gender, Income, Wealth	Three indicators of cognition from the Health and Retirement Study (HRS), TICS (Telephone Interview of Intact Cognitive Status) questions: word recall and numeracy

Tab. 1 Approach of Measuring Financial Literacy (continued)

Aim of the analysis	Authors	Demographic characteristics and socioeconomic attributes	Issues addressed in the questionnaires
Impact of financial literacy and schooling on wealth accumulation and pension contribution patterns.	Behrman, Mitchell, Soo, Bravo. 2010.	Age-Related Variables, Family Background, Personality Traits	Basic economics and finance risk and simple interest, more elaborate financial concepts, knowledge of retirement system
To measure several aspects of financial literacy and cognitive ability in a survey of subprime mortgage borrowers who got mortgages in 2006 or 2007	Gerardi, Goette, Meier, 2010	Age, Education, Gender, Ethnicity, Household Income, Employment Status	Numerical ability and basic economic literacy, and a measure of general cognitive ability. Time and risk preferences, details of the mortgage contract
The roles of financial literacy and impatience on retirement saving and investment behaviour	Hastings, Mitchell, 2011	Age, Education, Gender, Income	Chance of disease, lottery division, numeracy in investment context:, compound interest, inflation, risk diversification
Household financial decision making and financial literacy	Almenberg, Gerdes, 2011	Gender, Age, Income, Education, Region of Origin	Basic financial literacy, essentially the ability to perform basic calculations, financial products and concepts
Causality between financial literacy and retirement planning	Sekita, 2011	Gender, Age, Education, Self-employed, Unemployed, Workers, and Retirees	Understanding of compound interest and involves simple calculations
Survey focused on mapping the level of knowledge of financial markets of the students	Tomaškova, Mohelska, Nemcova 2011	Students	Forty questions is divided into attitude questions and knowledge questions (personal budgets, finances and basic terms, financial products)
Measures the current level and the distribution of financial literacy, investigates its determinants and its effects on retirement planning behaviour.	Fornero, Monticone, 2011	Age, Education, Gender, Place of Residence, Income Level	Financial literacy tests similar to HRS. Wording of the tests: Interests, inflation, stocks
To measure basic and advanced financial knowledge and study the relationship between financial knowledge and household wealth.	Van Rooij, Lusardi. Alessie, 2011	Education, Age, Gender, Income, Wealth, Marital Status, Number of Children, Retired, Self-employed	Questions were mostly designed using similar modules from the Health and Retirement Survey (HRS), a few questions are unique (stock market, mutual funds, bonds)
The relationship between financial literacy and retirement planning	Almenberg, Soderbergh 2011	Age, Education, Gender, Occupational Status, Income (pre-tax), District, Living Arrangement	Health and Retirement Survey (HRS) (Interest, Rate and Inflation, Risk Diversification)

Source: [1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 14, 16, 17, 21, 23, 24, 25, 26]

2. Case study from Latvia

In 2010 Swedbank organised one of the first campaigns aimed at testing financial literacy of the population. Within the framework of this campaign 300 secondary school pupils passed a test (12 questions). Only 1 % of the pupils could answer absolutely correctly to more than 10 questions and only 43 % of the pupils evaluated their knowledge of personal finance management as good or excellent. The results of the test demonstrated that the issues of which the pupils were least aware were the following: 1) responsible borrowing; 2) savings for the future; 3) tax management. Certain part of the society is definitely interested in improving their financial literacy as demonstrated by the results of the survey conducted by Swedbank in March and April of 2012. More than 540 Bachelor study programme students took part in the survey, and every second student stated that they would be willing to learn how to manage their money more efficiently.

In May of 2012 SKDS conducted a representative online survey, in which 505 private individuals took part. As a result it was discovered that the knowledge in financial matters among the members of the public was at an average level. The survey was conducted by means of the test "Financial IQ" posted on the home page of Nordea Bank, which comprised 40 questions of different degree of complexity on financial planning, loans, leasing, savings, and pensions. According to Financial IQ assessment, a large part of Latvian population "live for today for tomorrow never comes", and the majority of inhabitants have rather weak awareness of the issues of finance and their own wealth accumulation. The survey demonstrated that there are considerable gaps in people's knowledge in such finance related issues as loans, pensions, savings and investments. In turn, it was discovered that the people have slightly better awareness and knowledge of financial planning and management.

Inability to skilfully manage personal financial resources may cause certain problems if people are involved in entrepreneurship. In June of 2012, Swedbank conducted a research having polled 435 small and medium business owners, managers, department managers, and accountants. Similar to the previous survey, within this research the respondents considered their own knowledge of financial analysis and planning to be appropriate only for everyday activities and were willing to improve them. One out of five respondents assessed their knowledge of these issues as insufficient.

An anthropological research conducted by the Association of Latvian Commercial Banks and the University of Latvia was presented in June of 2012. The aim of the research was to determine financial literacy of the young people. Within the framework of the research 21 on-site focus group interviews were conducted, as well as 67 interviews with young people and 15 interviews with the members of the teaching staff in 19 Latvian schools. Interviews and discussions covered numerous topics – awareness of financial literacy and its measurement, the involvement of informants in financial activities, assessment of the sources of data and skill acquisition, legal capacity of the informants taking into consideration historical, developmental and future contexts. Research results identified the following problems pertaining among the pupils: 1) the range of theoretical knowledge taught at secondary school is wide, but the pupils often

do not know how to use it in real life situations; 2) young people consider that they lack knowledge and skills for long-term planning; 3) most frequently young people consider themselves as passive economic agents [27].

The aim of the campaign "Idea Support" organised by the Association of Latvian Commercial Banks in cooperation with Swedbank Institute of Personal Finance in July of 2012 was to determine: 1) what problems young people have to face; 2) what knowledge and skills are necessary to raise awareness concerning these issues; 3) how this knowledge can be transferred (which methods to apply). The work was conducted in three working groups: experts – representatives of commercial banks and higher educational establishments; young people in 18 to 22 age group; parents and teaching staff. The authors of this article were among them and participated in discussion as experts from HEI. Group work and cooperation among the groups provided the insights into the problems that can be identified in the area of financial literacy: 1) Target audiences financial literacy of which should be improved are different with respect to age, experience, practical skills, and developed preconceptions; 2) Awareness of the functions and operation of the tax system is insufficient; 3) There is no awareness about various financial instruments, financial strategy; 4) Individuals need applied knowledge necessary in case a person enters labour relations and other forms of legal relations, which require drawing up legal documents; 5) Contribution that the family makes in developing primary skills and further maintaining of financial literacy is insufficient; 6) There is insufficient awareness about the value of money and economic goods, detachment from reality; 7) Current educational process does not promote development of civil responsibility, critical thinking, and practical application of information; cause and effect relation analysis, development of intercomparison skills, as a result an individual does not identify oneself as being economically active, and alienation from the state occurs.

In October-December of 2012, the University of Latvia in cooperation with the Association of Latvian Commercial Banks implemented the research project "Financial Literacy in Households". In total 29 interviews were conducted with an aim to discover what financial literacy young people acquire in the family. Research results demonstrated that there are numerous paradoxes in the financial literacy of the members of the family of the young people. Financial decisions made in the households on the one hand are connected with the factors that formal economics would classify as emotional rather than rational, and are based on everyday experience.

3. Data and Methodology

Within the framework of the research project "Enhancing Latvian Citizens' Securitability through Development of the Financial Literacy" implemented at Riga Technical University the authors conducted a pilot study. In February of 2013, 88 respondents were polled using a questionnaire, which comprised 34 questions divided into 6 modules. The questions addressed the issues concerning personal income tax returns, personal budget, cost analysis and cash flow management, banking services, insurance, risk management, accumulation of savings, and investments. The respondents were

invited to evaluate their awareness (skills) in these issues, as well as estimate the level of their interest (importance), using 5-point scale. In assessing awareness and skills 5 points signify that the respondent has high level of awareness / it is easy to make decisions, in turn, 1 point signifies that the level of awareness is extremely low / it is very difficult to make decisions independently. In assessing interest in and importance of the issue, 5 points stand for very interested / it is an important issue, and 1 point signifies not interested / this issue is not important. In order to estimate the reliability of the questionnaire, the authors measured its internal consistency using Cronbach's Alpha analysis. For data processing the values determined by SPSS were used: Cronbach's Alpha – 0.949, Cronbach's Alpha Based on Standardized Items – 0.950.

Demographic and socio-economic characteristics of the respondents were the following: females – 67 % and males – 33 %; age groups: below 25 – 54.5 %, from 25 to 40 years of age – 10.2 %, from 41 to 60 years of age – 29.5 %, above 60 – 5.7 %; depending on the household type: living alone – 22.7 %; living with parents – 30.7 %; family without children – 19.3 %; family with children – 27.3 %. 51.1 % of the respondents are currently studying at the higher educational establishment, 24 % have graduated from the higher educational establishment, 18.2 % have secondary or vocational secondary education, 3.4 % have graduated from college.

In 28 out of 34 questions female respondents demonstrated higher mean level of awareness/skills than male respondents. Fig. 1 presents the mean assessment of respondents' awareness/skills in points depending on the gender.

Fig. 1 Awareness/skills depending on gender

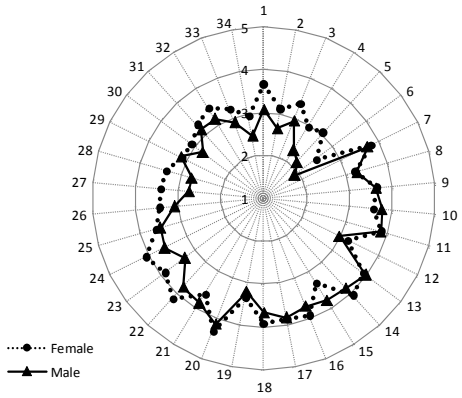
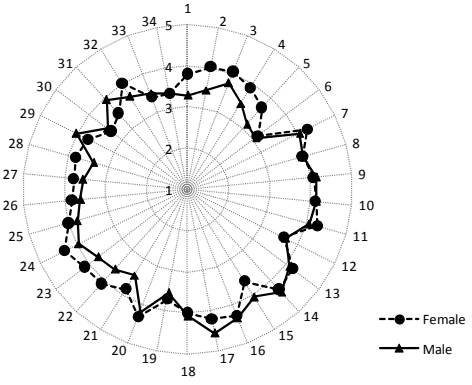


Fig. 2 Interest/importance depending on gender



Source: own calculations

1st Question Module. Personal Income Tax Return, Questions 1 to 6. On the whole in this module the lowest mean values in assessing awareness and skills are observed (3 out of 6 answers were ranked below 3 points). The highest value is 3.45 points given to the general question: *What is the purpose of filing a personal income tax return? In which cases is it required by law? (Question 1, Fig.1)*. In turn, the valuation of the interest in all questions by both male and female respondents is higher than the valuation of awareness, and is higher than 3 points (Fig.2). The respondents ascribe the highest value of 3.95 points in assessing interest answering the question on the types of deductible expenses, which allow receiving tax rebate from the state budget (Question 3,

Fig.2). The lowest awareness is observed among respondents in the age groups below 25 and above 60 years of age.

2nd Question Module. Personal Budget of a Private Individual, Questions 7 to 12. Mean values for interest (4 out of 6 valuations are above 4 points) are higher (Fig.2) than for awareness, where the lowest mean valuation (3.1 points) was given answering to the question on the ability to compile a balance in order to determine the level of prosperity at a definite moment of time (Question 12, Fig.1). The valuation of interest in this question is also lower – 3.62 points (Question 12, Fig.2), comparing with the questions on alternative ways to reach financial targets (Question 8), risk assessment (Question 9) and preparing a personal budget (Question 10). The highest valuation of awareness is given by the respondents in the age group from 41 to 60 years of age, in turn, the greatest interest is expressed by the respondents in the age groups from 25 to 40 and from 41 to 60 years of age.

3rd Question Module. Private Individual Cost Analysis. Cash Flow Management, Questions 13 to 17. Valuations of interest (out of 5 questions 4 mean values are above 4 points) surpass valuations of awareness and skills (values from 3.46 to 3.98 points). The highest valuation of awareness is given by the respondents in the age group from 41 to 60 years of age, in turn, the greatest interest is expressed by the respondents in the age groups below 25 and from 41 to 60 years of age. The lowest awareness is demonstrated by the respondents in the age group above 60.

4th Question Module. Banking Services Offered to Private Individuals, Questions 18 to 22. In this question module the highest mean values were ascribed assessing awareness and skills (out of 5 questions 2 valuations surpass 4 points). However, the valuation for interest in the question on whether the respondents know *what services the banks offer to use electronically (*Question *22, Fig.2)* is a little lower (3.94 points) than the valuation for awareness (4.03). The highest valuation of awareness is given by the respondents in the age group from 25 to 40 years of age. The greatest interest is expressed by the respondents in the age group below 25. The lowest awareness and interest are demonstrated by the respondents in the age group above 60.

5th Question Module. Insurance and Risk Management, Questions 23 to 28. Mean values for awareness of different pension levels (Question 25), profitability of the pension schemes (Question 26), types of life insurance (Question 27) are from 3.17 to 3.92 points, and interest values for these questions fluctuate from 3.68 to 4.21 points, female respondents assess their awareness and interest on average higher than male respondents. The highest valuation of awareness is given by the respondents in the age group from 41 to 60 years of age. On average respondents have greater interest in health insurance (Question 24 – 4.21 points) and in the issue what type of mandatory insurance is obligatory (Question 23 – 4.00 points). These questions received the highest valuation (above 4 points) in the age groups below 25 and above 60 years of age.

6th Question Module. Accumulation of Savings and Investments, Questions 29 to 34. On the whole mean values for awareness about profitability (Question 29), simple and compound interest calculation (Question 30), the impact of inflation on purchasing

power of money (Question 31), deposits (Question 32), differences between shares and bonds (Question 33) and their valuation before making an investment (Question 34) are in the range from 2.80 to 3.37 points. Mean value ascribed by the respondents in the age group from 41 to 60 is below 3 points, in turn, the respondents in the age group above 60 give even lower assessment – below 2 points. The respondents in the age groups below 25 and from 25 to 40 years of age also take greater interest in these issues with the highest valuation.

In 12 out of 34 questions the respondents assessed their average interest as being above 4 points. These 12 questions include 4 questions on the budget, 4 – on cost analysis, 2 – on bank services and 2 questions on insurance and risk management. The highest average interest level is demonstrated by all respondents answering the questions in the 2nd Module on private individual cost analysis and cash flow management – out of 5 questions 3 are assessed at above 4.3 points.

The respondents demonstrated the lowest level of interest in tax return filing and submission opportunities, as well as making savings and investments; mean value is below 3.5 points.

The respondents that are members of a household type *family with children* clearly display higher level of awareness, as their mean valuation in 16 questions out of 34 is higher, in particular in the question module on tax return, on the issues of services offered by banks, and insurance and risk management. At the same time, assessing their interest/importance the highest mean valuation in 20 out of 34 questions was given by the respondents who live alone.

Currently university students (51 % of the respondents) demonstrate the highest level of awareness/skills in the issues related to savings and investments. Running Spearman's rank correlation test statistically significant link has been observed among all questions in the modules, however, mean values for awareness/skills in six questions on investments and savings display in total 28 essential links with the valuations given answering to the questions on private individual budget, banking services, and insurance and risk management.

Conclusions

The obtained research results attest the presence of the problems associated with theoretical and practical financial literacy of the population. On the one hand, the knowledge and skills of the private individuals are insufficient; on the other hand, there is interest and awareness that these issues are important. This influences the ability of an individual, who is seen as a member of the society, to adapt in the economic environment. It can be observed that each age group is characterised by different level of awareness/skills and interest/importance, which presumably determines how comfortable an individual feels making economic decisions, which are closely connected with the field of finance. Growing interest in the issues of financial literacy conditions

the need to carefully study the existing experience in further research, to characterise population groups more precisely, and to improve the questionnaire.

The assessment of financial literacy of an individual provides the data on factors that limit the opportunities to increase financial efficiency and to reduce unnecessary expenses. The assessment process, which involves the respondents as active agents, in a certain way activates the thinking process of the participating individuals focusing them on the issues related to responsibilities, opportunities and risks in the field of finances. Concerns expressed by the Latvian financial service industry with regard to consumer's ability to use financial services responsibly should be positively evaluated; however, doing so the line between marketing and advertising of a financial product, and genuine education of an individual is fragile.

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Secure Information Logistics

Abstract

With the internet development and further development of information technique applications, Information logistic system is used more and more widely in logistics enterprises, but consequent security issues of network information have become increasingly prominent. The paper was set in information system of secure information logistics; security problem of application system in logistics chain under network environment was studied, and security of logistics information system was introduced. Modern computers made it possible to automate administrative/business processes, at least to some extent. Modern technology allows exploiting other options to organize logistics. In particular, it allows employing a "construction site" logistics that can increase both the productivity and quality of administrative work. If we accept that information are goods, so we can manipulate with information as a goods, not only from offer and demand point of view but also from transport and price one. Information exchange and/or information flow is known under term communication. The way of communication between sender and receiver through communication channel without taking into account effect of possible impostors is nowadays impossible. Logistics information system is a man machine interactive system which is composed of staff, hardware and software of computer, network communication equipment and other office equipment, and its main function is to make collection, storage, transmission, processing and sorting, maintenance and output of logistics information to provide supports of strategic, tactical and operational decision-making for logistics managers and other organizations managers. For exaltation logistic information system on the secure logistic information system is need to introduce security mechanism, like encoding, decoding techniques into communication processes.

Key Words

logistics, security information systems, communication, administrative

JEL Classification: J28, R41, L86

Introduction and related works

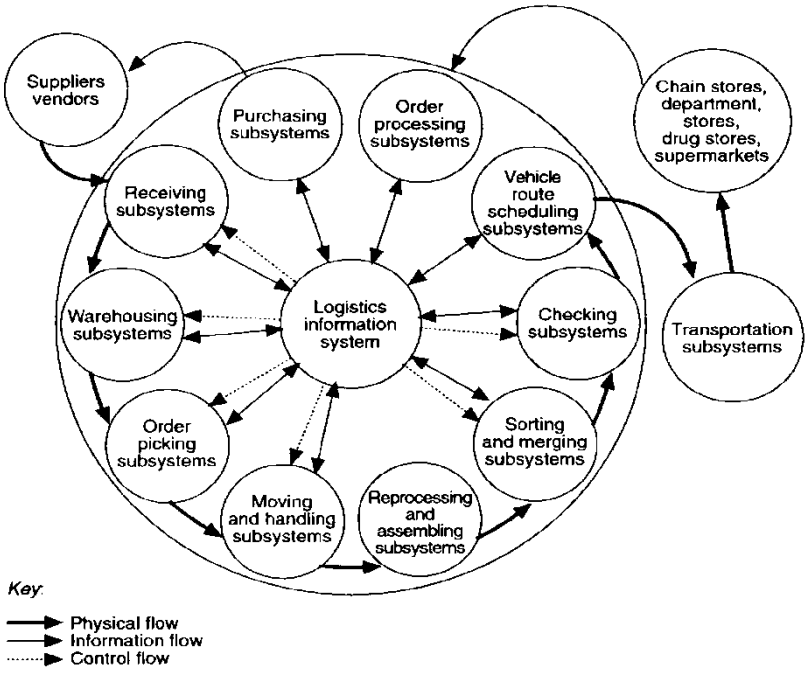
The New Oxford American Dictionary [1] defines logistics as "the detailed coordination of a complex operation involving many people, facilities, or supplies", and the Oxford Dictionary online [2] defines it as "the detailed organization and implementation of a complex operation" Another dictionary definition is "the time-related positioning of resources." As such, logistics is commonly seen as a branch of engineering that creates "people systems" rather than "machine systems". Many applications one can found in military area, for example [3], [4] or for describing the routes from airport to hotel and/or exhibition for example [5]., The importance of information system security on logistics is described in [6] where is explained following: „Currently, more and more

logistics companies have established logistics information system of their own, and used Internet to develop business management and information services, so that operational efficiency of inner enterprises and customer service quality are not only improved, and reaction speed of market, decision-making efficiency and comprehensive competitiveness of enterprises are also improved. To logistics enterprises, security of networks and information systems data is premise and foundation for normal sustainable development of operating activities, therefore, various security technologies are fully used to establish a multi-channel strict safe defence-line, and it is very necessary to maximize security protection of management information system and all data of logistics." Communication problems connected with virtual organizations are mentioned for example [13], [14]. Newly one can see open logistic data problem within cloud computing [16] namely from security point of view.

1. Logistics

Logistics can be referred to as an enterprise planning network used for the purpose of information, material management, capital flows. In the words of a layman, it can be described as delivering at the right time, for the right price and in the right condition. When seen in the modern day competitive business scenario, it includes complex information along with importance to the control and communication systems of the organization. No matter the size and the area of operations of an organization, logistics information plays an important role in the achievement of the goals of the organization [7]. Connection all logistic flows together is depicted on the figure 1, which represent classical logistic system.

Fig. 1 Classical logistic system represented connections of all logistic flows together



Source: [8]

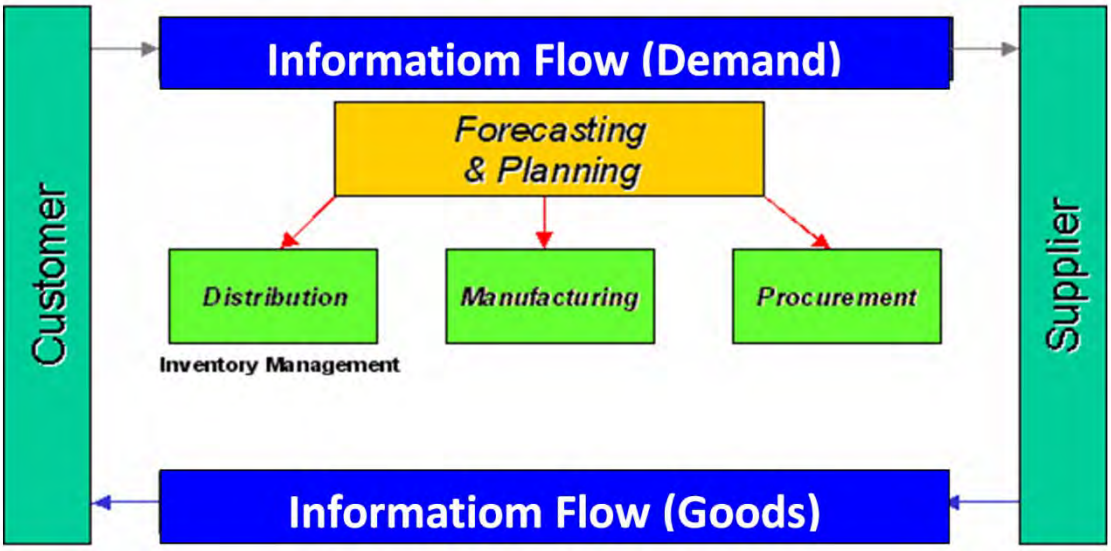
Within the transport and logistics sector there are many stakeholders that take different roles in the informational value chain[9]. The so-called Common Framework, aiming to support interoperability between ICT systems in logistics, provides a basis for discussion ICT applications and related semantic (i.e., content-related) standards in the transport and logistics sector. The Common Framework divides the sector into four domains, as shown in Figure 2.

Fig. 2 Transport and Logistic Domains

Source: adapted according [9]

ICT Interoperability issues are well known and various standardisation organisations promote standards for information exchange, for example in the transport sector: UN/CEFACT, OASIS/UBL, GS1, ISO etc. If we accept that information are goods, so we can manipulate with information as a goods, not only from offer and demand point of view but also from transport and price one as is depicted in Figure 3, (it is a core of this article).

Fig. 3 Information logistic chain



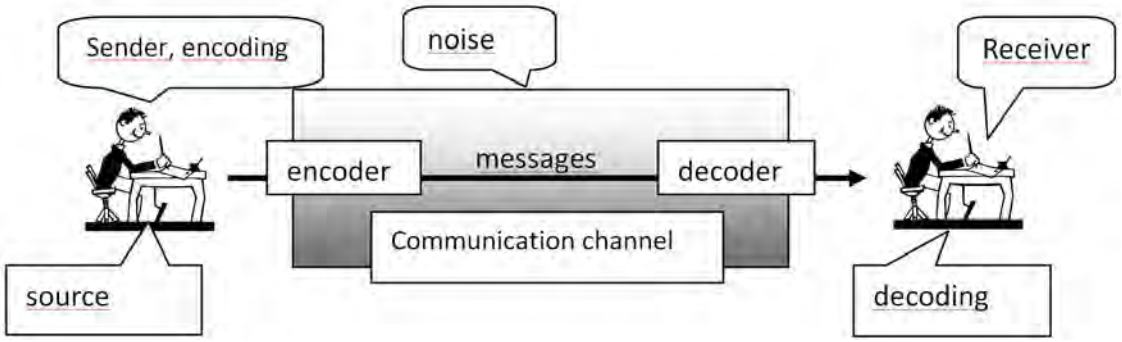
Source: adapted according [10]

2. Communication

Information exchange and/or information flow is known under term communication. Communication is "something" which is done every day and everywhere in the world

and not only by human beings. It also takes place in the flora and fauna and even between somatic cells. Within information sources, for example using some internet search engine, are possible to find a hundreds of definitions what does meaning word communication. The basic definition for the term "communication", as it will be used in this contribution, is the following one: The means of transmitting information between a speaker or writer (the sender) and an audience (the receiver). The basic scheme is depicted on Figure 4.

Fig. 4 Simple one-way communication chain



Source: own

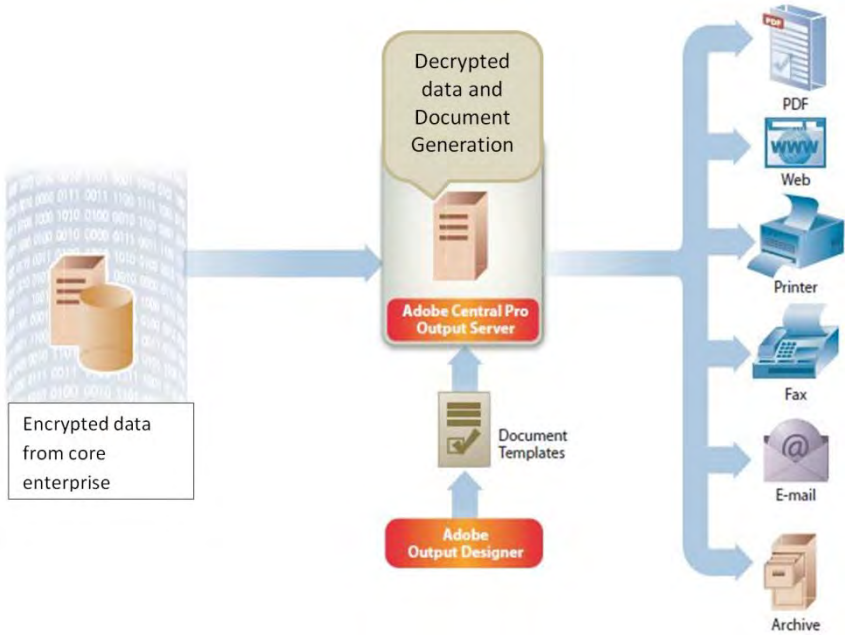
There are six elements in the process of communication which work as vehicles for sharing information, ideas and attitudes with someone. These elements are:

- **Source:** Communication starts with the source, a person who speaks, writes or makes facial expressions is called the source. Source can be an individual or group of people or an inanimate like computer, radio, music, book, etc.
- **Encoding:** Message always remains in the mind of the source in the form of an idea, when he gives physical shape to it by transmitting it into words or pictures then it becomes a message. This process is called encoding. In other words, the process of giving physical shape to one's idea is known as encoding or the speaking mechanism of the source is called encoding. Giving names to things, ideas and experiences is also an act of encoding. Strictly speaking, encoding is the assignment of an element of one alphabet to an element of other alphabet.
- **Message:** The coded idea of the sender is called message. When we write, the written script is our message. Message always transmits from source to destination. An objective of a message is to make understood the receiver as desired by the source.
- **Channel:** Channel is a medium or transmitter which carries the message of the sender to the receiver. In case of mass communication, the channel might be radio, TV, Internet or newspaper. The sensing power of an individual is also channel of communication such as taste, Smell, hear and see etc.
- **Receiver:** The recipient of the message is called the receiver. It may be an individual group of people or an organization.
- **Decoding:** Decoding is an inverse process to encoding.

3. Communication security

The way of communication between sender and receiver through communication channel without taking into account effect of possible impostors is nowadays impossible. Logistic management information system is a man machine interactive system which is composed of staff, hardware and software of computer, network communication equipment and other office equipment, and its main function is to make collection, storage, transmission, processing and sorting, maintenance and output of logistic information to provide supports of strategic, tactical and operational decision-making for logistics managers and other organizations managers.

Fig. 5 The ideal solution for leveraging the data to produce high-quality document output in a variety of formats



Source: adapted according [11]

A contemporary approach for addressing critical issues such security are Web services that can be easily assembled to form a collection of autonomous and loosely coupled business processes. It is thus crucial that the use of Web services, stand-alone or composed, provide strong security guarantees. Web services security encompasses several requirements that can be described along the well-known security dimensions, that is: integrity, confidentiality, availability. Moreover, each Web service must protect its own resources against unauthorized access. This in turn requires suitable means for: identification, whereby the recipient of a message must be able to identify the sender; authentication, whereby the recipient of a message needs to verify the claimed identity of the sender; authorization, whereby the recipient of a message needs to apply access control policies to determine whether the sender has the right to use the required resources. Following picture depicted a part of enterprise information system for producing different type of document. These documents are stored within enterprises and/or Web repository in encrypted forms. Note: The difference between encryption and encoding and/or decryption and decoding is in key knowing. If the key is known for

everybody it is encoding, if not it is meaning that the key is known for sender and receiver only, so it is encryption.

Apart from technical issues for increasing communications security is improving the administrations' processes. Administrative quality depends on the interplay between people, rules (operational instructions), and tools used in the administrative work. Changing one of these components without adjusting the other two may result in no or little effect, or even a negative effect on the administrative quality.

Very often, introduction of computerized tools is not accompanied with a substantial revision of operational instructions (rules). The old instructions become obsolete and counterproductive; the new ones are created based on the try-and-error method. As a result, the "ad-hoc" operational instructions may not take into account all possibilities built-in the new tools or all consequences of their use and finally leads to depressing the security [12]. Communication security is possible modelling by Petri nets [15] for better simulation and mental understanding of reality, but a deeper description of this approach is beyond the contribution.

Conclusion and Outlook

This paper show us, that logistics may not be understood in the traditional form, but that may be related to information's logistics and security, as well. With rapid development of economy, information technology and Internet as well as IT processes being constant to deepen, networking has become the inevitable choice of IT development of logistics enterprises, and logistics management information system has been widely used; IT throughout logistics decision-making, business processes and customer service has brought a great promotion to development of logistics enterprises. However, the security problem of network information system emerges, then how to guarantee safe operation of logistics management information systems is a challenge logistics enterprise faces in development process of IT.

Future research in the field of secure information logistics will focus on extending the framework towards automatic need detection and integration of feedback mechanisms. Automatic need detection investigates the integration of existing context information about the user in order to derive an initial profile that can be approved and modified by the user.

Acknowledgements

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Innovation for Competitiveness – Sole Trader in the Construction Sector

Abstract

The period we live in is characterized by constant change in every field of science and also in every field of human activity. New business environment places greater requirements on business units. They have to change ordinarily used tools and methods for newly created ones in a very short time period to be able to offer successfully their products or services in today´s competitive environment. It is unpleasant for huge companies, but almost impossible in a case of small companies or sole traders. Sole traders have to overcome many problems connected with production process and availability of sources. To be able to ensure the safety and usefulness of all sources used in business, each company has to use tools provided by disciplines like informatics, information technologies, management, financial management, risk management etc. Sole trader´s possibilities are limited by available funds. This may be the reason why many sole traders do their businesses nowadays the same way they did it years ago (without the use of new tools and technologies). This article seeks to answer the question how to optimize final output and use of sources to achieve maximum business success in a case of the sole trader in the construction sector with use of available tools provided by modern information technologies. In the beginning, it summarizes general information about sole traders and their business potential in a given area. Then the practical problems solved in a daily business are described and the alternative solutions are suggested. The practical case of sole trader´s decision-making process is given and the findings are described and evaluated at the end of the article.

Key Words

competitiveness, construction sector, decision-making process, innovation, sole trader

JEL Classification: M10, M15

Introduction

New business environment is nowadays characterized by many changes. Everything, technology, culture, economy, business, politics etc., changes quickly. Business units have to solve problems that have arisen in connection with this situation, with increasing pressure to improve their existing products or services. [1] Possible solutions are presented by constantly developing disciplines such as informatics, information technologies, management, financial management, risk management, etc. The proposed solutions operate with the assumption that main problems which have to be solved are connected with the relationship between the quality and quantity of used sources and the final output of the production process or the process of providing services. Another problem is the availability of all necessary sources. Sources are represented most often

by production inputs, money, information, information technologies etc. All these inputs are necessary for the smooth running of production process that enables future successful business. To be able to ensure the safety and usefulness of all sources used in business, each company has to use tools provided by disciplines described at the beginning of this paragraph.

Limiting factors in the decision-making process of all business entities are time and available funds. Final decision-making about changes in the way of providing products or services depends on the type of business entity and many other factors (financial and non-financial).

If the decision-making process is provided by the sole trader, the responsibility for final solution of the problematic situation is up to this only person, even if there is the possibility to ask the expert on a given area. All possible scenarios of future development have to be considered. All possible outputs, benefits and negative impacts, have to be described and assessed. All additional spendings connected with designed changes have to be detected and evaluated.

A few years ago, there were a lot of sole traders who decided to continue with their activities the same way they did it before. Currently, the situation changes. Even if the change of existing business activities takes money and time, many sole traders decide to accept the change. The reason is the change of the way of their thinking and view of innovation. They are able to recognize its positive impact on their future business activities. Such an acceptance may sometimes be the only possibility to maintain the sole trader´s position in the competitive market.

Typical problems in the decision-making of the sole trader are solved in the part number five. This part of the article tries to detect information that enables sole traders to answer the question how to optimize final output and use of sources to achieve maximum business success with use of available tools provided by modern information technologies. Seeking the answer to this question is the main aim of this article. The practical case of sole trader´s decision-making process connected with innovation is given and the findings are described and evaluated at the end of the article.

The real view of innovation and its adoption differ business unit to business unit, country to country, area to area. [9] Everything depends on many factors such as the type of the business unit, final output (business sector), type of used production process or process of providing services.

1. General information – innovation and sole trader

1.1 Innovation

The driving force of the business is innovation. Innovation is defined using many different ways. One possibility of defining this term is described by the following definition.

"Innovation is the process of translating an idea or invention into a good or service that create value or for which customers will pay. To be called an innovation, an idea must be replicable at an economical cost and must satisfy a specific need." [15]

Types of innovation:

- deliberate application of information,
- imagination and initiative in deriving greater or different values from resources,
- generating new ideas and their conversion into useful products,
- ideas applied by the company in order to satisfy the needs and expectations of the customer.

Innovation is used as a tool that helps to create new methods (alliance creation, joint venturing, flexible working hours, creating buyer´s purchasing power). Sources of innovation opportunities can be divided to internal and external.

Internal sources of innovation opportunities (inside the enterprise):

- unexpected events (success or failure),
- contradiction (reality vs. expected reality),
- innovation as the answer to process requirements (necessity of the innovation),
- changes in sector structure or market structure.

External sources of innovation opportunities:

- demography,
- changes in the world view, moods and meanings,
- new knowledge (scientific and non-scientific). [4]

Innovation is usually associated with activities of large enterprises. They have the necessary financial sources that help them to ensure also activities in the area of development and innovation. Their main aim is to be successful in future business. This is usually the reason for selecting the group of people that specialize in the field of development and innovation. [10]

The situation of small companies and other business subjects is different. Innovation in a case of a sole trader can be represented by new ways of thinking about processes that are necessary for smooth running of the business. Sole trader can make a decision about the use of new tools of management in business process or about the use of modern information technologies. Advantages connected with the use of modern managerial methods are usually visible in a relatively short time period. Their use leads to greater business success. Main problems with implementing innovative thinking to business seem to be the lack of financial funds and time.

1.2 Sole trader

Definition of the sole trader: "Sole trader or sole proprietor is when a business is owned and controlled by one person who takes all the decisions, responsibility and profits from the business they run." [13]

This type of business represents the simplest businesss structure (the easiest way of trading). The owner makes all decisions, does all the work. Sole traders can hire other people if they want or need to. On the other side, sole trader is also liable to pay any debts that the business may incur.

Tab. 1 Advantages and disadvantages of running business as a sole trader

Advantages	Disadvantages
Clearly defined ownership	
Full control of business activities	Full responsibility for business activities (losses and liabilities)
Simple business structure	Irreplaceability of the sole trader
Simple documentation	Lack of time for planning business strategy
Taxation advantages – connected with low profit	Taxation disadvantages – connected with high profit
Financial information is kept private	Need to engage the external accountant
Decision making process is fast	
Closer relationships with customers	Difficulties in obtaining larger contracts (low capacity,...)

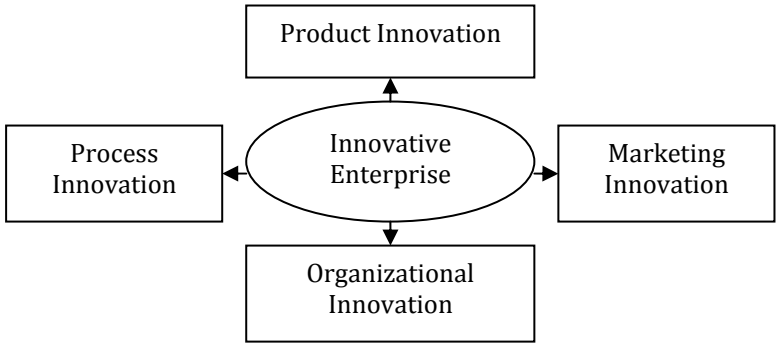
Source: author, according to [5]

Sole trader is classed as a small business or SME (small enterprise), because there is the only employee who is also the owner of the company. [7]

2. Current division of innovation

Innovation is currently described as the situation when the product or service is new from its producer´s point of view (subjective point of view). Current division of innovation is: product innovation, process innovation, marketing innovation and organizational innovation.

Fig. 1 Main types of innovation



Source: author, according to [12]

- **Product innovation** is introduction of new products or services or products or services significantly improved with respect to its characteristics or intended uses. This is represented by the significant improvements in technical specifications, components and used materials, software, user-friendliness or other functional characteristics.
- **Process innovation** is introduction of new or significantly improved production processes or delivery methods. This includes significant changes in techniques, equipment and/or software. Process innovation includes new or significantly improved methods for service production or provision. They may include significant changes in equipment, software used in enterprises oriented to services or procedures or techniques used to deliver services. Process innovation also includes new or significantly improved techniques, equipment and software in associated supporting activities such as purchasing, accounting, computing and maintenance.
- **Marketing innovation** is introduction of new marketing method including significant changes in product or packing design, product placement, promotion or pricing.
- **Organizational innovation** is introduction of new organizational method in business activities of the enterprise, in workplace organization or external relations. It is the type of innovation that was never used by the company in the past and is the output of strategic decision adopted by management. Examples of such innovation are new methods of education in the company, new methods of knowledge sharing inside the company, new methods of division of responsibilities, etc.

Innovative enterprise is defined as the enterprise that implemented any kind of innovation (technical or non-technical) in a given time period. [12]

3. Business units and innovation in the Czech Republic

The approach to innovation in the Czech Republic is influenced by many factors. The main difference between our republic and other countries like for example the USA may be seen in risk aversion and in different approach to innovation. In the Czech Republic innovation is usually described and explained as something that has been invented and can be transferred to new (other) conditions (countries, types of businesses). Possible chance to improve the situation in innovative thinking is seen in implementation of new methods of education. The aim is to provide students the new perspective on innovation and to motivate them this way to their own future business activities. [6]

Situation in innovation and its implementation in czech business was described in 2012. This part of the article uses the secondary data. Data are provided by AMSP ČR (Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic). [3] The research conducted by AMSP ČR and Česká spořitelna from 9th May 2012 till 21st May 2012 answered the questions connected with innovation and its application within the small and medium-sized enterprises. The reserach involved 514 respondents from small and medium-sized enterprises from all regions of the Czech Republic. Researched areas were production, trade and services.

Findings of described research were summarized in the final report. This report sets out, among others, the following facts. In last two years innovation was realized by 91 % of respondents. The enterprises often cooperate with other external subject. Innovation is usually realized as the answer to customer´s requirements.

Tab. 2 Most often realized innovation

Type of innovation	% of respondents
Service innovation	72
Marketing innovation	48
Product innovation	37

Source: author, according to [3]

Innovation is usually financed by internal financial sources of the enterprise.

Innovation in small and medium-sized enterprises is conducted irregularly. Most of the owners or managing directors of the companies have experience with any kind of innovation. Innovation is seen by them as an important part of activities ensured by business units. Small enterprises are actively engaged in innovation processes. They explain them as the meaningful activities. Future situation in implementation of innovation seems to be similar to the current state. [2]

4. Selected problems solved by the sole trader

One possibility how to run business is to become the sole trader who is classified as a small enterprise. Advantages and disadvantages of this way of running business were described in chapter "General information – innovation and sole trader". Situation of the sole trader is similar to the situation of small and medium-sized enterprises. Current extremely competitive environment faces this type of business unit to many problems [14] connected with the fulfillment of its objectives. (Usual objectives are to make a profit and to remain on the market.)

Generally, the main problems of current sole traders in construction sector are connected with finance and customers. There is no certainty that the sole trader will receive the agreed payment for provided and delivered services. Problems with bed debts are also solved by other enterprises, but in a case of the sole trader, this problem represents serious existential problem. This type of problem has to be solved without the existence of sufficient legislative support. That is the reason why the sole trader reaches its objective (agreement) only in a small number of cases.

Solution to some of the problems described in the table number three can be seen in innovative thinking. It represents the sole trader´s tendency to improve his current situation with the use of available inputs. Which type of innovation (product innovation, process innovation, marketing innovation or organizational innovation) will be selected depends on factors such as business sector of the sole trader, available financial sources, other available sources, etc.

Tab. 3 Division of the selected problems solved by the sole trader

Area of concern	Specification of the problem
Organizational structure – sole trader	Sole trader´s skills and abilities
	Substitutability of the sole trader
	Lack of time for planning business strategy
Business activities	Decision-making on - production inputs / inputs in the provision of services
	Decision-making on - production process changes / changes in the provision of services
	Decision-making on - the outputs of the production / outcomes in the provision of services
	Maximal possible use of sources
Finance	Ensuring the legal obligations
	Decision-making on the use of external accounting services
	Investment
	Maximal possible use of sources
	Enforceability of receivables (bad debts)
	Setting of the payment deadlines
Relationships with suppliers and customers	Communication – use of modern technologies
	Setting of appropriate relationships with the suppliers
	Setting of appropriate relationships with the customers
	Difficulties with obtaining larger contracts

Source: author

5. Decision-making process of the sole trader – case study [8]

Selected business unit is the sole trader offering his services in the construction sector – processing of construction projects and related documentation. He has close relationships with four other sole traders that offer similar type of services. This represents the possibility of cooperation and the possibility to ensure advice almost immediately if necessary. Financial issues are ensured by cooperation with the external accounting company.

The sole trader thinks about innovation suitable for his business. His aim is to optimize costs. He also wants to improve the quality of final services (by the use of modern technologies). His funds are limited, but he doesn´t want to use external financial sources (bank loan, ...). All investments will be financed using prepared financial funds (300 000 CZK). Which suggested alternative should be selected in this case and why?

Decision-making process of the selected sole trader, according to [11]:

1. Objectives definition.
   - Cost reduction.
   - Improvement of the final services quality.
   - Extension of the service portfolio.
2. Development and consideration of all alternatives.
   Alternatives:
   - 1 – No changes: no additional costs – no time optimization – no additional benefit.

- 2 – Process innovation 1:
  - additional costs (technologies and other inputs) – time optimization
  - additional benefits (higher amount of processed contracts, better customer services
  - increase in customer satisfaction).
- 3 – Process innovation 2:
  - additional costs (technologies and other inputs) – time optimization
  - additional benefits (higher amount of processed contracts, better customer services, increase in customer satisfaction).

Types of investments:

- A1 – No investment.
- A2 – Purchase of new hardware and upgrade of existing hardware.
- A3 – Purchase of software.
- A4 – Entrepreneurial education.
- A5 – Website creation.

All alternatives involve different types of investments. Alternative 3 involves also the investment A5 that is not involved to evaluation of the alternative number 2. This is caused by the need to offer the sole trader alternatives that bring similar type of improvement with different demands on financial resources. The suitable alternative has to be selected and implemented in a short-time period and the sole trader has prepared limited amount of money.

3. Evaluation of selected alternatives.

Tab. 4 Selection of suitable alternative

Alternative	Type of investment	Investment costs (t_0)	Total investment costs (t_0)	Investment income (t_{10})
1	A1	0 CZK	0 CZK	0 CZK
2	A2	150 500 CZK	250 000 CZK	384 000 CZK
	A3	74 500 CZK		
	A4	25 000 CZK		
3	A2	197 000 CZK	350 000 CZK	576 000 CZK
	A3	112 500 CZK		
	A4	25 000 CZK		
	A5	15 500 CZK		

Note: t_0 ... year of the decision-making process; t_{10} ... ten years after the decision-making process

Source: author, according to [8]

4. Adoption of suitable alternative, its solution and implementation.

The most suitable alternative seems to be the alternative 2. This alternative doesn´t require additional financial sources. It will change the quality and speed of production process using modern information technologies (new software for preparation of construction projects). This may enable future higher amount of annually processed contracts, greater customer satisfaction and bring additional income (profit). Implementation of this alternative leads to increase in competitiveness of the sole trader.

Implementation of the alternative 2 represents the first step of innovative process that will be followed by an effort to implement the product innovation. Implementation of product innovation seems to be more difficult (many complementary activities, higher implementation costs, etc.).

This case study uses primary data obtained on the basis of an expert interview conducted with the sole trader that operates in the construction sector. [8] Data was processed in accordance with the procedures described in the available literature. [11]

Conclusion

According to changes in market conditions, business units try to increase their competitiveness. The result of their effort, success or failure, depends on many factors (type of business unit, business sector, available sources, required outcomes, external conditions – legislative, etc).

Innovation as the driving force of the business represents one possibility how to increase the competitiveness of the enterprise successfully. The approach to innovative activities differ country to country. Situation in the Czech Republic is unique in approach to innovative thinking as to something that can enable future success of business activities, but is too financially demanding. [16] Innovation is often perceived more as a transfer of existing solution (idea) to different type of business. Situation is different according to size of the enterprise. Small and medium-sized enterprises have positive approach to innovative activities. They are trying to implement great amount of innovation each year. They prefer to finance all innovative activities using their company sources. Generally, the situation in innovative activities has become better and the future predictions are also quite optimistic.

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Capital Structure of an Enterprise – Open Questions Regarding Its Displaying under the Czech Legislative Conditions

Abstract

A successful financial management of an enterprise closely relates to optimum setting of the capital structure and especially to the development of an efficient composition of the sources of company assets financing. In the past few decades many scientific theories were studied, dealing with the optimal structure of capital resources and analyzing multiple factors affecting the process of determination of the optimal ratio between capital equity and debt capital. In this way a wide platform of theoretical approaches and opinions on this matter was created. The aim of this article is to discuss theoretical approaches to the evaluation of capital structure of enterprises and its application under the terms and conditions of the existing Czech accounting and tax legislation. Based on the research into the current state of knowledge in this area, a comparative analysis of the influence of selected effects on the methods used for the displaying and evaluation of the capital structure of an enterprise was executed. The initial study analyzes the impact of the different approach to displaying of financial leasing liabilities within the leaseholder balance-sheet liabilities. In accordance with the Czech legislation, the leasing liability may or may not be displayed in debt capital section of the balance-sheet. The second study confronts the theory of tax shield with the current tax legislation provisions. When credits are arranged between defined entities, debt capital interests, as the essence of the tax shield theory, cannot be fully recognized from the tax point of view. This is reflected by lowered effect of the tax shield and it also affects the result of business of an enterprise. This article should open discussion with regard to contrasts between theories and economic reality. The difference creates a platform for innovative approach to the development and assessment of the enterprise capital structure.

Key Words

capital structure, enterprise, Czech accounting and tax legislation, financial reporting, leasing contracts, income tax, tax shield, capitalization test

JEL Classification: G32, H25, M41

Introduction

The state of human knowledge in the field of economy sciences has been constantly developing throughout the centuries. One of the most important areas of the economic theory is the financial management of business enterprises and all the attributes affecting the success of the whole process. One of the key factors contributing to sound managerial decisions in the field of financial management is the decision-making regarding the capital structure, i.e. optimum setting of the ratio between own and debt

resources used for the specific business plan. This matter went through various development phases with different weight attributed to individual factors affecting the development of the enterprise capital structure. Pursuant to the existing economic theory the individual thoughts are refined making obvious which particular aspects associated with the use of equity capital and debt capital should be included in the decision-making processes regarding the most suitable coverage of enterprise assets. However these theories cannot be simply accepted without considering and weighing the impact of the real economic environment the specific enterprise operates in. The questions resulting from the confrontation between the theory and economic practice may be a source of innovation in the field of human economic thinking. On the basis of extensive research into vocational publications and the knowledge gained, two of many open questions were selected, concerning the evaluation and displaying of capital structure of business enterprises in the Czech Republic, in the view of tax and accounting legislation. A comparative analysis was carried out covering the different methods for displaying of financial leasing by lessee. The results were quantified using specific data of the selected enterprise. The same method was applied also to the assessment of the level of indebtedness and the exploration of the subsequent impact on the efficiency of the so called "tax shield". In this way the selected questions shaped the innovative angle on the resolution of theoretical issues in contrast to economical practice.

1. Summary of previous research results

The basis of financial business management is the decision-making regarding the amount and structure of assets and the total amount and structure of the needed capital. While the ownership structure is increasingly determined by the field of business, the theory of financial management has been leading long-term discussions about the capital structure of enterprises and its optimization. The topic is mainly addressed in the publications of Modigliani and Miller [14], who provoked, to the greatest extent, the discussion with their claims about the independence of market value of the firm on its capital structure (MM-I model) and about the growth in market value of the firm due to the increasing share of debt to equity capital (MM-II model). In this model authors [15] studied the general conception of the idea of tax effect on the capital structure. The enterprise value was defined not only based on the expected after-tax revenue, but rather as the function of the debt interest rate and the level of indebtedness. Here is the mathematical formulation of this idea:

$$X^{\tau} = (1-\tau)(X-R) + R = (1-\tau)X + \tau R = (1-\tau)\overline{XZ} + \tau R, \quad (1)$$

where: X^{τ} = after-tax revenues, τ = marginal tax rate, X = revenue before taxes and interests – may be expressed as $\overline{XZ}$ (i.e. multiplication of the expected revenues and the accidental factor), R = debt interests.

From the relation above it is obvious that the tax impact on the decision-making regarding the capital structure of an enterprise must be accepted, as it considerably strengthens – through the tax shield (τR) – the importance of the involvement of debt

capital for the enterprise economic success. It is however clear that even the indebtedness has some restrictions (debt trap risk) and managers should seek for other sources of financing too.

Another contribution to this discussion are publications and articles of Kraus and Litzenberger [10] who postulate a compromise (trade-off) theory, in which optimal capital structure involves balancing the tax advantage of debt financing against financial distress costs. The inclusion of the impact of personal taxes [13] and the tax shield [3] significantly deepened the capital structure theory. Brealey and Myers [2] subsequently defined that the most important source of financing of a company is its equity capital consisting of owner´s deposits and retained earnings. The second important source of financing is assumed to be debt and other sources of financing are options and derivative financial market instruments such as futures, forwards and swaps.

With the current state of knowledge, it is obvious that the capital structure of business entities is influenced by many factors, whether the internal or external, apparent or hidden. The influence of various determinants over time was verified in many studies, the results of which were quite diverse. Therefore, it is impossible to establish the general validity of specific factors influence on the capital structure of enterprises, though some economists more or less concur with some factors [16]. Nobes and Parker [17] emphasize that financing of enterprises differ significantly in continental Europe and Anglo-Saxon countries. The reason is a way of raising capital. While in continental Europe, there are many small family businesses which raise capital primarily from banks, in the United Kingdom and also in the United States, there are a large number of private holders of shares who have invested their funds in companies through the capital market.

In the Czech Republic, a significant factor limiting company decisions on the capital structure remains underdeveloped capital markets (Initial Public Offering, IPO) [12] and it can be said that another factor is also less flexible banking sector with long-term lending of business needs. Despite this fact bank financing is the primary source of external finances of companies in the Czech Republic [4]. The most important features of financial management at both national and international levels include the continued development of innovative ways of financing, the transition from traditional debt (outside) sources represented by bank credit to new, non-classical forms (i.e. financial or operative leasing) and increasing focus on international financial flows [9].

2. Sample

Using the following examples we want to demonstrate the potential effect of legislative requirements on the displaying and distortion of the enterprise capital structure that may result in incorrect decisions by enterprise managers. For this purpose we choose one of several effects of the accounting legislation on the displaying of assets used on the basis of a leasing contract by a lessee (so-called financial leasing). We further demonstrate the impact of the existing tax legislation (namely income tax) on the credit policy of an enterprise.

2.1 Financial leasing and its displaying within the capital of the lessee in the Czech Republic

Under the existing legislative conditions in the Czech Republic the financing of an enterprise by leasing may be considered as one of the most important sources of external capital. Should the enterprise be not able to get a bank credit, it often resolve the required financing through a leasing contact. For the financial leasing purposes, there is a contract concluded between the lessee and the lesser which is similar to credit or loan contracts. The lessee assumes all the risks and rewards associated with the asset. The financial leasing means a long-term lease of the asset. The lease period corresponds usually with the economic life of the leased long-lived asset. In the Czech Republic the leased asset is owned by the lesser who must keep records of it and depreciate it [1], as the Czech financial reports, namely the balance-sheet, put a stress on displaying the assets on the basis of the ownership title thereto. The lessee is therefore only displaying expenses associated with the lease. The Czech accounting legislation does not stipulate the exact bookkeeping method for leasing recognition in the books of accounts and therefore we often see two different ways of recording of the leasing transactions. The lessee is only posting individual repayments reflected as the decrease of monetary resources against leasing expenses reducing the lessee's earns before taxation. Other lessees post the installments for the relevant accounting period right at its beginning as a short-term liability that is settled at the end of the year. Also these methods of posting are quite frequented in the Czech accounting practice – and in many cases recommended by auditors. [18] Another option is to show the total amount of installments under the leasing contract reduced by the advance payment already settled. In this case the total amount of installments is displayed as a long-term liability against accruals of assets (pre-paid expenses). This long-term liability is then gradually reduced by individual repayments.

Illustrative example

As at 18.4.2013 the company XY acquired the personal vehicle Škoda Superb kombi 2.0 TDI via financial leasing [6]. All the risks associated with the use of this asset are transferred to the lessee. All the amounts are stated including the value added tax (hereafter VAT). The lessee is a VAT non-payer. The vehicle acquisition price (according to the leasing contract) is CZK 789,000.00 from that the advance payment is CZK 100,000.00 (paid on 18.4.2013). The price of the leasing, according to the leasing contract, amounts to CZK 937,592.00 in sum. The price of the leasing covers 36 leasing repayments (CZK 574,066.00 in total), the initial installment paid in advance (CZK 100,000.00) and the vehicle net book value in the end of the leasing contract (CZK 263,526.00). According to the payment schedule the company will be obliged to pay the installments for the period of 36 months, whereas pursuant to the leasing contract the vehicle net book value will amount to CZK 263,526.00 in the end of the contract. The ownership title to the vehicle will be transferred to the lessee upon expiration of the leasing contract. The expected life of the vehicle is 5 years. As of the leasing contract signature date we assume the bank account balance of CZK 2,000,000.00, covered by registered capital in the same amount. We assume the company generates yearly gross profit (prior to inclusion of leasing costs) of CZK 300,000.00.

The leasing installments pursuant to the payment schedule (CZK 15,946.28 per month) and the share of advance payment attributable to the relevant accounting period (CZK 2,777.78 per month) will affect profit of the current period. The costs of leasing are represented by the lessor reward (CZK 4,127.56 per month). Should the company follow the standard practice in the Czech Republic, no debt will be shown in the capital structure reported at the end of each year. In the Czech environment it is however possible to show the leasing installments as a long-term debt. For the income tax purposes the lessee is allowed to reflect the properly posted leasing installments – rentals in the tax base. These installments shall equal to the number of months of tax depreciations in the relevant depreciation class. In accordance with the Czech income tax legislation, personal vehicles are covered in the second depreciation class with the depreciation period of 5 years, i.e. 60 months. We can conclude that the above mentioned leasing contract is prepared in a way so that the leasing installments may be recognized in the tax base. The part of the leasing costs attributable to the amount of depreciations of the leased asset represents a tax-deductible cost under the currently valid income tax legislation (linear depreciation).

The following table 1 shows the comparison of the development of capital structure of the company XY for both options of displaying the leasing financing during the existence of the leasing contract as at the end of balance-sheet days, i.e. as at 31.12., in the years 2013, 2014, 2015 and 2016. The right part of the table shows the proposal for displaying the long-term leasing liability.

Tab. 1 Reporting of the enterprise capital structure as at 31.12. in 2013, 2014, 2015 and 2016

	Capital structure without lease debt		**Capital structure with lease debt**	
31.12.2013	Capital	CZK 2,000,000	Capital	CZK 2,000,000
	Retained earnings	0	Retained earnings	0
	Profit / Loss	131,483	Profit / Loss	131,483
	Long-term debt	0	Long-term debt	430,549
31.12.2014	Capital	CZK 2,000,000	Capital	CZK 2,000,000
	Retained earnings	131,483	Profit / Loss	131,483
	Profit / Loss	75,311	Profit / Loss	75,311
	Long-term debt	0	Long-term debt	239,194
31.12.2015	Capital	CZK 2,000,000	Capital	CZK 2,000,000
	Retained earnings	206,794	Retained earnings	206,794
	Profit / Loss	75,311	Profit / Loss	75,311
	Long-term debt	0	Short-term debt (reclassified long-term debt)	47,834
31.12.2016	Capital	CZK 2,000,000	Capital	CZK 2,000,000
	Retained earnings	282,105	Retained earnings	282,105
	Profit / Loss	243,828	Profit / Loss	243,828
	Long-term debt	0	Long-term debt	0

Source: Author's own contribution

An important information for the displaying of the capital structure are the financial reports, however from the facts presented above it is obvious they often have a low predicative value under the current conditions in the Czech Republic. Within the scope

of internal assessments we can recommend to enterprises not to include in their calculations of various indicators related to the capital structure data from the financial statements only (also in [8]). For external users the internal sources of data are unavailable and therefore we can conclude that in vast majority of cases the assessment of the capital structure of the enterprise subject to analysis will be considerably distorted.

2.2 Tax shield effect and its application in practice

The matter of tax impact on the enterprise capital structure is a phenomenon subject to research for many years. The capital of business entities comprises of capital equity and debt capital. If the debt capital prevails in the capital structure, we refer to a low capitalization. Enterprises make use of debt capital not only to realize their business activities, but also for planning of their taxes. Credit and loan interests represent tax-deductible costs for enterprises which means that the excessive use of credits and loans (tax shield) may lead to unwanted reduction of tax liability. Therefore a tax legislation dealing with the low capitalization issue was adopted in EU, including Czech Republic as well [11]. The aim of this measure is to avoid tax evasion associated with the use of interests as a tax-deductible cost.

The basic principles of low capitalization test under the conditions of the Czech Republic are based on the testing of credit and loan interests between related entities (Section 23, par. 7 of the Income Tax Act, [11]). The act also defines exclusions from testing (not subject to legislative provisions) and time range. The coefficient for the calculation of the amount of interests acceptable from the income tax point of view may be defined as follows:

$$C = \frac{\left(n \cdot WAEC\right)}{WACL}, \tag{1}$$

where: n = multiplication determined in Section 25, paragraph 1, subparagraph w) of the Czech Income Tax Act (in 2013 n = 4); $WAEC$ = weighted average of equity capital; $WACL$ = weighted average of credits and loans between related entities. [11]

Based on the coefficient calculated (values are based on the weighted arithmetical average where the weight is represented by duration of the state of equity capital resp. state of credits and loans in days), the enterprise shall decide what part of interests will be acceptable in terms of tax deductibility.

Illustrative example

The calculated weighted average of credits and loans between related entities amounts to CZK 10,200,200.00. For the past taxation period, the weighted average of the own capital amounts to CZK 2,250,000.00. In the past period the interests amounting to CZK 920,000.00 were paid under the loan contracts. The coefficient for the calculation of interests is determined as a quadruple of the weighted arithmetical average of own

capital to weighted average of credits and loans between related entities – the result is 0.88. The coefficient for application of tax deductible interests is therefore 0.12. Considering this coefficient (after applying it to the actually paid interests from loans), the tax deductible interests amount to CZK 110,400.00.

The theoretic thesis of the development of capital structure assumes that the costs of capital are – due to interest tax shield – decreasing with the level of indebtedness which means that on the other hand the market value of the company increases. Considering the tax practice, the reality is quite different – interests from credits between related entities are unacceptable from the tax point of view (non-deductible) and therefore the efficiency of the tax shield and also the resulting net income are different. The following table 2 simulates the disproportion between the theoretical (A) and practical (B) application, where the tax base is increased by the value of interests from credits between related entities not passing the capitalization test, i.e. the interests amounting to CZK 809,600.00.

Tab. 2 The impact of theoretical (A) and practical (B) application of tax shield on net income

Values subject to research	Variant A	Variant B
Profit / Loss	1,000,000	1,000,000
Tax base	1,000,000	1,809,600
Income tax 19 %	190,000	343,710
Net income	810,000	656,290

Source: Author's own contribution

The research into the interaction between the equity and debt capitals represents the basic problem for the development of the enterprise capital structure. Based on the example above we can conclude that the decision-making regarding the capital structure is based on the identification of costs associated with the obtaining the relevant type of capital. The price of debt capital is the interest that must be paid. The price of debt capital is also affected by tax legislation, thus having a clear impact on the net income of enterprises.

3. Discussion

The selected examples clearly demonstrate that theoretical solutions are not always fully applicable in the business practice. Considering the thesis saying that the source of innovation may be for instance a change of attitude or the conflict in dissonance with the economic reality [7], a question comes up whether the adopted theoretical presuppositions are sufficiently revised by their users in the view of the constantly changing economic environment.

There are contradictory opinions between tax and accounting experts concerning the displaying of for example the total amount of financial leasing. The so called balance-sheet displaying showing the full liability from the leasing was even declared as obsolete and incorrect in the preparation course for the qualification test of tax advisors organized by the Chamber of tax Advisors in 2010 [18]. It is however still present in the

business practice [5] and considering the outcomes of the first illustrative example, this approach may be even recommended to business entities. Interests from credits and debt securities represent a tax-deductible costs that reduces the income (earns before taxation). The theory considers this cost of debt capital as fully acceptable from the taxation point of view (so called "tax shield"). This fact decreases the price of debt capital for enterprises and promotes its wider use, provided that the financial balance of the company is not negatively affected by this (no costs of financial distress). In economic practice, however, the effect of tax shield is considerably lowered by the tax regulation. The other illustrative example clearly demonstrates the effect of tax shield with regard to interests from credit between the related entities.

The outcomes of the research into the selected questions associated with the development and displaying of capital structure indicate that without the reflection of the economic reality including the relevant legislative provisions, the data for the efficient decision-making by managers as well as stakeholders of business enterprises are not available.

Conclusion

The decision-making regarding the structure of assets and sources of their financing, i.e. the capital structure of the company, is the essence of the company financial management. The issues related to the optimum structure of capital have been discussed since the fifties of the past century and due to the continuous development of economical conditions we expect these discussions to continue even further. The original ideas were based on the fact that the costs of total capital remain unaffected by changes in the financial structure (the effect of taxes was not considered) – therefore the searching for the optimum indebtedness of an enterprise makes no sense. Later, when the effects of taxes reducing the price of debt capital were considered, the conclusion was that the costs of total capital are decreasing as the result of higher indebtedness and therefore companies should seek for higher share of debt resources in their total capital (compared to their own resources). The aim of this article was to contribute to these discussions by selecting two areas that may be – under the Czech accounting and tax legislation – in direct conflict with the generally accepted theoretical presuppositions.

Firstly we selected financial leasing from lessee's point of view and methods of its displaying in the financial statements (particularly on the liabilities side of the balance-sheet) as one of the primary resource of input data for the assessment of enterprise capital structure. In the Czech Republic where the capital market is less developed and the banking sector not so flexible, financial leasing is considered as one of the important sources for financing of enterprise needs. But because all assets are displayed under the Czech legislation in the balance-sheet on the basis of the ownership title only, in practice we often see that companies (lessees) recognize their liabilities under leasing contacts only as individual repayments of the leasing-related costs (being accepted as tax deductibles) and do not display this long-term source of financing in their balance-sheets at all. Skilled managers may consider this fact while making calculations of the capital structure (e.g. ratio between equity and debt capital or average costs of capital as

well as other indicators), getting the necessary data from auxiliary records, but external users (e.g. potential investors) have only the official financial statements at their disposal, without these valuable information, so they often assess the capital structure incorrectly. We therefore recommend companies to recognize and show their liabilities under financial leasing contracts in their balance-sheets. Secondly we confronted the generally accepted theory of tax shield with the economic reality as the fact is that under specific conditions not all interests may be recognized as tax deductibles. Pursuant to many theories the debt financing is preferable as the debt costs reduce the income (earns before taxation) and therefore the debt is cheaper compared to equity capital (the effect of so called "tax shield"). However with the increasing level of indebtedness, the risk of financial distress costs is rising. Anyway the theory does not deal with the fact that not all debt costs are tax deductibles which may suppress the positive effect of the tax shield. Such debt costs cover the interests from credits between related entities. The model example shows the impact of this situation on the company net income.

In the conclusion we must emphasize that theories should be always confronted with the existing economic reality as without such reflection the input data used for the decision-making of internal as well as external users may be considerably biased.

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The Competitiveness and Competitive Strategies of Companies in the Czech Part of Euroregion Nisa

Abstract

This paper was written as part of a specific research project at the Technical University of Liberec, Faculty of Economics. It deals with part of the aim of the project: the use of competitive strategies and competitive advantages among companies in the Czech part of Euroregion Nisa. Methodological approaches to the topics of competitive strategies and the competitive environment from the perspective of experts on the matter are presented in the introduction to the paper. The main aim of the paper is to identify competitive strategies, primarily from the perspective of individual branches of industry and the size of a company, because it cannot be said that there is one and the same strategy for all types of company. It is in the interests of each and every company to determine what its best competitive advantage is in light of the situation on the market, the aims it has set for itself or its opportunities and resources. A well-chosen competitive strategy provides the chance to place a product on the market in the best way possible in relation to what other companies have to offer. The authors of the paper deal with the issue of the main competitive strategies that companies now use and in what lies their competitive advantage. Results and discussion are found in an evaluation of primary research undertaken among 170 companies in the Czech part of Euroregion Nisa. A detailed investigation confirmed that competitive advantage and competitive strategies need to be understood as multi-dimensional and multi-factored. It can be contended that successful companies need to produce differentiated products at low cost and have to be flexible.

Key Words

competition, competitive strategy, research, ompetitiveness, investigative competitive strategy, competitive environment

JEL Classification: M31

Introduction

Competition is fierce in the 21st century, even fiercer in fact that before due to faster transformation. The market situation is chaotic and not overly transparent as a result of incoming companies, a situation that forces some companies with a long tradition to close and leave the market. Another factor to affect the 21st century is the changing way in which customers think and the changing requirements they have. Customers have ever greater and more exacting demands on products. The basic task for the company, then, is to identify these individual customer requirements, to continually monitor events on the market, to have the chance and be able to respond operatively, to produce and offer a wide range of quality products, to try and shorten innovation cycles and mainly to shorten delivery times. Companies apply these principles in an attempt to be

competitive! This brings us to the first question that companies have to deal with at all times and under all conditions: **What precisely is competitiveness?** [1]

There are many opinions of what competitiveness really is and many definitions. As Suchánek and Špalek write in their article [2], "*We draw on the fact that competitiveness can be defined as a quality that allows a business entity to succeed in competition with other business entities. It is clear that market success can only be achieved by whoever knows how to apply a particular competitive advantage in the right way and is able to achieve ascendency over his competitors by doing so. The question is, how do we judge competitiveness? Given that the competitiveness of a company is related to its vision of the future and that a business strategy emerges from this vision, there exists the possibility of ascertaining competitiveness from the value or size of the value which the company creates. From this perspective, competitiveness is conditional on performance and it should stand that a company which is competitive also performs well".*

1. Competitive strategies

Competitiveness is based on the competitive strategy that a company sets out in the best possible way. It is through this that the company prepares itself for competitive battle and operation in a particular branch. Although the given environment in which a company wants to operate is very broad and includes social and economic influences, the significant and fundamental aspect of the environment is the branch in which the company operates and carries out its activity. The independent structure of the branch has a considerable influence on determining the basic competitive rules of the game. [3, p. 3]

Whenever a company is able to identify its main rivals, it must also create such a competitive strategy that provides it with the possibility of placing its product on the market as best possible in relation to what other companies can offer. Under no circumstances can we say that there is a best strategy for all types of company. It is in the company's interests to determine what its best competitive advantage is in light of the situation on the market, the aims it has set for itself or the opportunities and resources it has at its disposal. [5, p. 578]

The strength of the competition in industry rises continually and in some cases far outstrips how current competitors behave. The level of competition in a branch depends on the 5 basic competitive forces (suppliers, substitutes, customers, potential new competition and competition in the branch). The overall effect of these forces determines the potential for final profit in a branch, whereby the relevant potential for profit is measured from the perspective of the long-term returnability of invested capital. All branches, however, are not characterised by the same potential for end profit. This profit differs significantly, owing, for example, to the different overall operation of competitive forces.[3, p. 3]

Companies that compete with each other on the target market differ at any given moment from the perspective of their objectives and resources. Some companies might

be big, others small. Some companies have considerable resources, while others struggle to find money. Another perspective is that some companies are old and established and others are entirely new. Some companies are keen on a fast start-up and expansion, others are more interested in long-term profit. We can infer from this that all companies are structured differently and that a different type of competitive strategy is used for each and every one depending on the characteristics of the company. These companies will make efforts to occupy a certain competitive position on the relevant market. [5, p. 578]

Michael E. Porter suggests [3, p. 35] that, "There are three potentially successful general strategies to outmatch other companies in a sector when mastering the five competitive forces.

1. *Cost leadership* – Here the company tries to keep its production and distribution costs as low as possible so that it is able to set a lower price than competing companies and thus win a greater market share. [5, p. 578]
2. *Differentiation*. In this case the company tries to concentrate on being able to create a highly differentiated product or range of products and marketing programmes in such a way as to act as the leading company in the relevant sector. Thanks to this, the majority of customer will prefer this brand on the condition that the price is not too high. [5, p. 579]
3. *Focus*. This strategy is based on the principle that the company focuses only on certain market segments instead of concentrating on and trying to win over the market as a whole. [5, p. 579]

A company that concentrates on one of these strategies is very likely to succeed. However, a whole range of factors have an influence on companies (a change of environment and business cycle, the exchange rate, inflation, state regulation etc.) and we should therefore remember that the methodology which Porter recommends is fine for the present, but is static and lacks a view into the future. According to Mintzberg, low price is the decisive factor and not low costs. Pressure on costs stems from prices. A price might be low with regard to the high utility which the product provides, while focusing on operating at low costs also leads to the risky truncation of the company. [4]. Mintzberg adopts a position on the demand side, his strategy draws on the needs and wants of the consumer and introduced far greater flexibility to the discipline.

1.1 Market position as a competitive strategy

All companies maintain their position on the market by way of competitive moves. These moves are used to attack competing companies or to defend against threats that they might face from other companies. Individual moves change mainly in relation to the position that the company occupies on the market (**leader, challenger, follower or looking for market micro-segments**) [4, p. 580].

1.1.1 The strategy of the market leader

Many branches have an acknowledged market leader. Such a company has the largest share of the market and usually influences other companies in terms of changing prices and introducing new products to the market. Other companies respect the company occupying this position. Nonetheless, this position means that the company is continually under competitive attack by other companies. In the event that a company wants to become the market leader, it must be prepared to operate on several fronts at the same time. [5, p. 580]

1.1.2 The strategy of the challenger

Companies that occupy the second, third etc. position in the relevant branch might still be large companies and can use one of two competitive strategies. In the challenger strategy, the company must first define its strategic aims. All companies try to increase their own profit and this they do by increasing their market share. It is up to the company alone which competitors will be strategic and which it will attack. It might even attack the market leader, which carries a certain risk to counteract the considerable profits possible. This strategy works well if the market leader is not ideal for the given market. For an attack to be successful and the market leader to be overcome, the company must have a significant competitive advantage over the leader. This advantage takes the form of low costs, which allow prices to be reduced or higher quality provided at a higher price. Another option in this strategy is that the company can attack companies of the same size or smaller companies. Smaller companies are more likely to be under-financed and are unable to serve their customers well. [5, p. 590, 591]

1.1.3 The strategy of the follower

Companies occupying second position do not always want to take the market leader on. The market leader is never happy about someone trying to takes its customers from it. If a challenger begins attracting customers with lower prices, better services or new products, it might happen that the leader is able to copy this move very quickly in order to fend off the attack. A battle with the leader might end with both companies being worse off than they were beforehand, meaning that the challenger needs to properly think over each and every move in advance. That is why most companies are happier to follow the leader. By using this strategy, a follower has the chance to enjoy a number of advantages. The market leader is expected to frequently have to deal with the high costs associated with the development and innovation of new products. The reward for this risk is that it occupies the position of market leader. A follower has the opportunity to learn from how the leader proceeds and copy its tactics, or indeed improve on its products. Even though a follower does not occupy the position of leader, it can still achieve the same level of profit. [5, p. 595]

1.1.4 The strategy of micro-segmentation

There are entities in almost all branches that specialise in serving micro-segments. In this case, the company does not focus on the market as a whole or on large segments, instead tending to concentrate on gaps in the market. This is mainly the case for smaller companies with limited resources. What is fundamental, however, is that even companies with a low share of the market as a whole are able to achieve very decent profits by intelligently using gaps. The question remains as to why the use of such gaps on the market is so profitable? The reason is that the company concentrating on micro-segments knows the target group of customers so well that it is able to satisfy their needs better and with greater intensity than companies which casually sell their products to this segment. [5, p. 596]

1.2 A new approach to competitive strategies – investigative competitive strategies

The new concept of offensive strategies differs greatly from definitions of competitive strategies according to Michael E. Porter and from competitive strategies according to Philip Kotler. [5]. František Bartes [6] provides the following definition: "*An investigative competitive strategy is a strategy for achieving an advantageous strategic position in a competitive environment that allows the objectives set out to be achieved without any direct, long-term conflict with a rival. Essentially, this means that this competitive strategy looks to ensure victory (the achievement of objectives) even before entering the battlefield".*

A direct battle with a competing company need not always end in victory. If two similarly powerful companies with similar available resources clash with each other, it might end up that both companies are weakened and that another (third) company assumes the position of leader on the market as a whole. The aim of the new approach is to look for new opportunities, to create new demand or new market segments or brand new markets. As part of this approach, the company needs to create value, primarily for the customer.

Possible forms of investigative competitive strategies:

- **Satisfying the "hidden" needs of the customer** – The sort of need that the customer does not even know about, nor does the competition. The customer is very happy when a company is able to satisfy him. That means that this company is the first to come on to the market and offer the customer a premium discount and that its product finds itself within a competition-free environment, at least for a time. [6]
- **Strategic partnership.** It is possible in the world of business, and sometimes even desirable, for a company to have a competition strategy in the form of a strategic partnership, a phenomenon which has recently become very widespread. Such strategic partnerships are mainly designed to reduce competitive clashes and share the activity and resources of a competing partner. It can therefore be said that

strategic partnerships are a good way of dealing with relations with a competitor without conflict. [6]

- **The rational respect of the "status quo".** Certain market structures can themselves determine a form of cooperation that could benefit companies. One appropriate example is the homogenous oligopolistic market, where there are fewer suppliers, selling similar products that are indistinguishable. We can say that sales and company profits within this structure are very sensitive to changes of price. For this reason it pays to cooperate and not disrupt the status quo of the market price. [6]
- **Direct clash** (short-term). We have seen that a direct clash can be very risky and if alternatives do present themselves, it is better to use these and take steps to avoid such conflict. However, there is an approach in the investigative competitive strategy that does not rule out a direct clash, but only if this is as quick and possible, meaning that we achieve the required objective in a very short space of time. [6]
- **Transfer to pre-prepared positions.** In the event that a company is unable to achieve the objectives it requires in the given branch or competing with a stronger competing company would be of considerable danger to it, there is the option of leaving that branch and moving into another, the aim being to ensure the company's prosperity. [6]

Bartes describes term "Competitive Inteligence"has been introduced by way of definition, since the Czech equivalent had not been used in a uniform way. There is a Czech term "*Konkurenční zpravodajství"*, [7]

2. Results and discussion

This section examines and evaluates the quantitative information taken from a questionnaire survey. It is divided into two smaller parts, the first characterising the profile of respondents and the second concentrating on an analysis of competitive strategies. A total of 170 companies from the Czech part of Euroregion Nisa completed the questionnaire. This Euroregion Neisse – Nisa– Nysa lies in the border areas of three countries – the Czech Republic, Germany and Poland. Euroregion has established in 1991. All three parts of the region are united by many common issues and interests arising from similar system transformations and many years of common history. The River Nisa which forms the border between Germany and Poland is unifying element of the area as a whole and the traditional symbol of mutual cooperation.

The Czech part of Euroregion Nisa encompasses Česká Lípa, Jablonec nad Nisou, Liberec, Semily and the northern part of the Děčín district (around Šluknov) and covers around 4.5 % of the area of the Czech Republic. This part of the Euroregion is home to 135 municipalities (figure taken from 2011) and concentrates mainly on glassmaking, engineering, metallurgy, textiles, clothing, building and the food industry. Emphasis is placed on strengthening competitiveness and regional economic bases by way of cooperation, with special consideration for interaction between small and medium-sized businesses and in support of developing new business opportunities. [8]

2.1 Methodological procedure of marketing survey

The methodology used in the empirical investigation of the competitive strategies of companies is based on the definitions, expectations and principles set out in the introduction to the paper. A quantitative form of collecting data in a written questionnaire was chosen as the method of obtaining the information we required, this questionnaire taking the shape of an electronic survey created using the tools available at Google.com. The survey was carried out in January and February 2013 in the Czech part of Euroregion Nisa and was anonymous.

A uniform, standardised, structured questionnaire was used to gather data in which the wording and order of questions were precisely set out. Closed-ended, multiple-choice questions were mainly used in the questionnaire, although open-ended questions were employed to ascertain competitive strategies. We expected the respondents to confirm the views of the authors regarding the unambiguity of using competitive strategies.

2.2 The structure of respondents

For the purposes of considering the economic base, the Czech part of the region was divided into the districts of Liberec, Jablonec nad Nisou, Česká Lípa and Semily. A database was created of 250 companies active in the districts of Euroregion Nisa in question. These companies were contacted by telephone and subsequently sent an electronic link to the questionnaire in the Google.com system. One hundred and seventy questionnaires were subsequently processed.

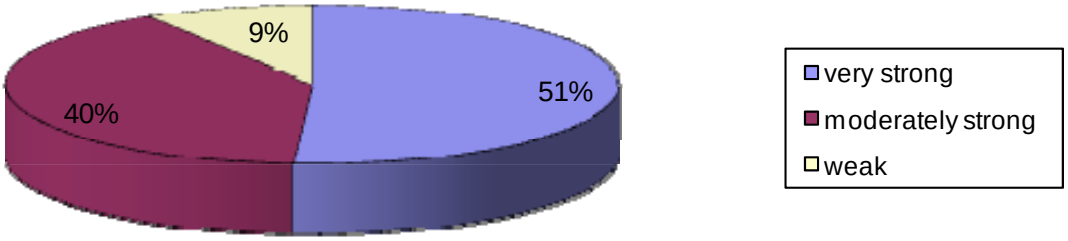
The opening questions 1 to 5 in the questionnaire were designed to identify the sample of respondents. The first question was used to identify the location of the company within Euroregion Nisa. Ninety respondents came from the Liberec district, around 53 %, 23 respondents from Jablonec nad Nisou (almost 14 %), 23 respondents from Česká Lípa (around 14 %) and 34 respondents from Semily (20 %). This spread of companies corresponds to the size of the districts in question. Approximately 14 % have less than 10 employees, 11 % of respondents gave an answer of between 10 and 20, the same number of companies have 21 to 50 employees, 41 companies (24 %) employ between 51 and 100 members of staff, 23 companies (14 %) have between 101 and 200 employees and 46 (27 %) have more than 200 employees. Of the 170 companies questioned, 29 % were joint stock companies (49 respondents), 2 were associations (1 %), 5 were natural persons (10 respondents), 6 were state enterprises (4 %) and 103 were limited liability companies (61 %). One hundred and nineteen companies, meaning a full 70 %, were identified as having no foreign capital. Another 4 companies have a share of foreign capital of up to 24 %, 9 companies a share of foreign capital of between 25 and 50 %, 11 companies between 51 and 76 % and 27 companies, around 16 %, have a share of foreign capital in the company of more than 76 %. Core business activities differed greatly and were divided into the categories of industry, services, trade and transport and other to help us process the information. Eighty-nine companies were classified under industry (building, engineering, glassmaking, food production, textile

industry), meaning 52 %, 77 were classified under services, trade and transport (45 %) and the rest, almost 3 %, are part of another branch.

2.2.1 Perception of the competitive environment

As shown in Figure 1, 51 % of all companies see their (competitive) environment as being very strong, 40 % of companies perceive it as moderately strong and only 9 % thought that the competition in their area was weak. It ensued from a more detailed investigation that the most competitive environment was among companies with up to 10 employees, almost 67 %, whilst only 51 % of large companies said the same. The most competitive environment from the perspective of the branch was the engineering and electronic engineering industry, with a figure of 64 %. By contrast, only 20 % of the respondents from the motor industry consider the competitive environment to be strong.

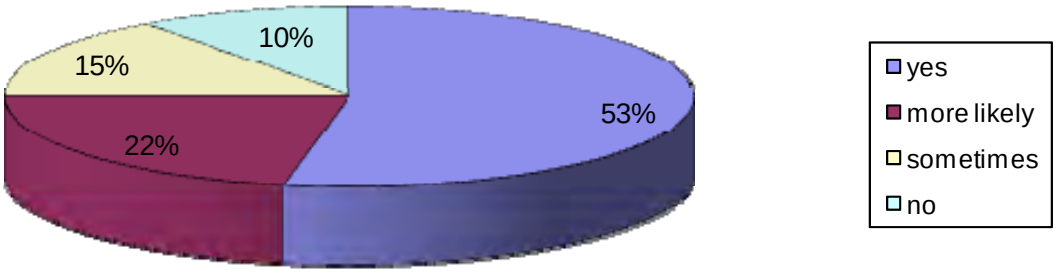
Fig. 1 Perception of the competitive environment



Source: compiled by the authors

All branches try to monitor the competition. Companies are most inclined to monitor their competitive environments themselves, 75 % of respondents doing so (see Figure 2). Around 15 % of respondents said that they sometimes monitor the competitive environment. Some 10 % of respondents stated that they use the services of an outside consultancy service. Mostly this issue is handled by the marketing department, analytical department, commercial department or sales representatives. However some companies did also mention headquarters abroad. This wide range of answers stems from the different sizes of the companies and what they focus on. Non-parametric statistical testing proved that there is no difference in the efforts made to break clear of the competition between Czech companies and companies with a predominance of foreign capital.

Fig. 2 Dealing with breaking clear of the competition



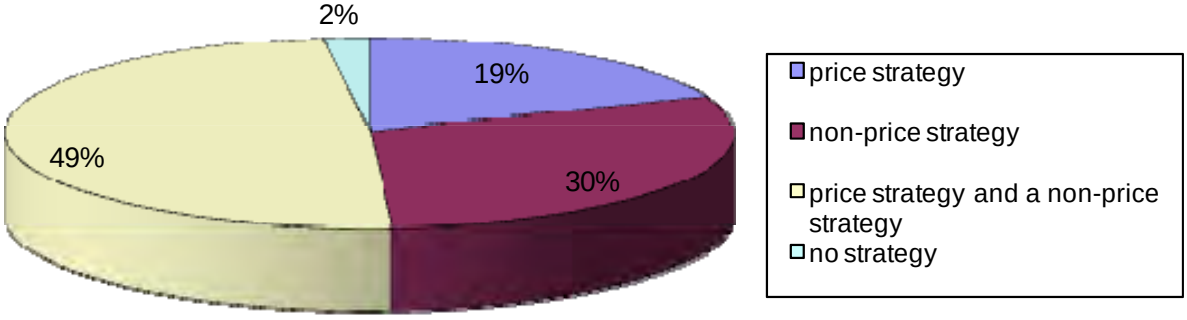
Source: compiled by the authors

This paper deals with the use of competitive strategies and so Figure 3 that follows shows the use of competitive strategies among the companies in the Czech part of Euroregion Nisa. Nineteen per cent of the respondents chose a price strategy as their clear strategy. Around 30 % stated a non-price strategy. Almost half of the respondents mentioned a price strategy and a non-price strategy, which was at odds with our expectation of the unambiguity of competitive strategies. Among the main non-price competitive strategies which respondents mentioned were short delivery terms, the quality and standard of services or servicing, flexibility, an individual approach and personal dealings, the name of the company, unique services, product innovation, top-class products and a wide range of applicability. One respondent stated that the company is the market leader and that it would rather lose customers than reduce its price. A more detailed investigation showed that industrial companies choose price competitive strategies *and* non-price strategies. Non-price strategies predominate among companies in the services/trade sector.

As far as Czech companies are concerned, 32 % of the respondents choose a price strategy, whereas only 15 % of companies with more than 76 % foreign capital do so. We therefore note a predominance of using this competitive strategy among Czech companies. The results of research into the use of competitive strategies allow us to say that more companies choose a strategy of differentiation as their competitive strategy and that this strategy predominates among companies having access to the consumer market and among purely Czech companies.

The competitive advantages serving as the basis of competitiveness that were stated included experience, more up-to-date technology, comprehensive services, the company having a stable background, trained and well-qualified staff, the quality of products, patents, tradition and the knowledge of employees. Respondents saw the competitive advantage of competitors in, for example, better communication strategies, a low price at the expense of quality, better sophistication in targeting clients and innovations.

Fig. 3 The use of competitive strategies



Source: compiled by the authors

Conclusion

Competitive advantage and competitive strategies must be understood as multi-dimensional and companies need to create an integrated product that represents a

certain configuration of services, values and the assurances of sellers within a modern concept. The term competitive advantage is a multi-faceted term as well. [9] Most companies stated a number of factors that they use in putting together their competitive strategy. From the research results it is evident that using the differentiation as the competitive strategy prevails.

These are not easy times for Czech companies. Ensuring prosperity in the ever more demanding conditions of the world and domestic market economy requires them to come to terms with a number of obstacles. For a company to be able to survive in the face of this competition, it needs to ensure continual growth in its work productivity and support for innovative activity, secure financing etc.

Successful companies differ from unsuccessful ones in the fact that they are diametrically opposite in terms of their internal organisation and management. They apply "world-class production techniques". Their priority is to maintain and further increase their competitiveness, not just in terms of their own production, but in relation to a whole range of other processes at the company as well. **Porter's** concept of a competitive strategy stresses that companies need to decide on only one competitive strategy to ensure that company objectives are achieved over the long-term.[10] This could be debated, of course, because under certain circumstances it is possible for a company to concentrate on a cost strategy and at the same time implement certain elements of a strategy of differentiation (for example adapting products to the requirements of the customer). Porter's strategies also lack the dynamic aspects of adapting a strategy in relation to changes in conditions on the market.

We believe that only one company can succeed in a given branch by operating at low costs, but that several companies can be successful using differentiation, each concentrating on something different, a fact the customer appreciates.

It can be said that there is no single competitive strategy that would apply to all companies. All companies must take their size and position in the branch into account and compare this to the competition. We can say that successful companies produce differentiated products at low cost and have to be flexible. This means combining price and non-price competitive strategies. However, comprehensive knowledge of individual strategies is required to be able to properly use their advantages. [11]

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Diversity Management: A Necessary Prerequisite for Organizational Innovations?

Abstract

Together with significant changes in the Czech society after the year 1989 and with opening up of the Czech economy and namely after the Czech Republic joining the European Union in the year 2004 there has been a growth of interest of companies in gaining, development and retaining the employees who have a high potential and who are able, by means of innovative ways, to achieve organizational strategies. The phenomena such as opening up, globalization and democratization of the society have brought increased interest in the company culture and Corporate Social Responsibility (CSR) within the field of organization strategies. In the field of human resources new approaches are applied, such as diversity management or integrated talent management. This paper presents a research study focusing on implementation of diversity management in the Czech corporate setting from the perspective of the large companies which, using their international background, successfully implement various diversity management policies and programs. The case studies presented in this paper continue our previous international research aimed to highlight just diversity management in the Visegrad countries [6]. The findings of the present study clearly indicate the connection between the organizational strategy and the CSR strategy and the organizational culture when applying various activities in the field of diversity management. The results of the research study also indicate that knowledge-based organizations are engaged in development and care of people who are represent human potential inevitable for the innovation potential of companies. The six companies covered in the case studies ranks among successful companies in the Czech Republic that have already gained a number of awards for activities in the above field. Therefore we assume as very useful to present a comparison of the examined elements of diversity management implementation in successful companies regarding development of both theory and for its practical application.

Key Words

diversity, diversity management, human resource development, case studies, innovations

JEL Classification: M12, M14

Introduction

Diversity management comes from the U.S. where it developed in the 1980s as a response to the problems of the labour market [22]. In the 1990s it entered Europe [24] but companies in the EU have seen its development and practical application only recently. Diversity is understood as one of the ways how to respect diversity but also

how to make good use of it not only within an organization but also in relation to its customers and stakeholders [5]. In the field of the development and application of human resources it has become very important and relevant namely after the Czech Republic entering the European Union. Diversity management is based on the strategy of an organization and it is also connected with corporate social responsibility [12], [19]. Within an organization the concept of diversity management relates to the appropriate part of the strategy and vision of a company and it is reflected in the organization culture as it supports communication within a company. New studies are being implemented abroad focusing on the use of diversity to support innovation. They are based on the assumptions that "„Innovation is an interactive process that often involves communication and interaction among employees in a firm and draws on their different qualities from all levels of the organisation." [21, p. 500]. In this respect attention is drawn namely to the knowledge and experience brought by diversity teams. Our main concern is, for the time being, to investigate the successful implementation of diversity management practices in Czech corporate setting.

1. Literature overview

With regard to the extent of this paper we give just the basic definition of the term diversity and refer to the work of [8], [9], [11], [14], [6]. According to the given authors the term diversity is defined namely as heterogeneity of the labour force from the point of view of several criteria or dimensions. We distinguish the so called primary dimensions [9], [3]. They are as follows: age, ethnicity, gender, mental/physical abilities and characteristics, race, sexual orientation. The secondary dimension may contain the following factors: communication style, education, family status, military experience, organizational role and level, religion, first language, geographic location, income, work experience and work style. The primary dimensions have big influence on our employability (what is typical about them is the fact they are self-evident and well noticeable). As for the companies, Hubbard, for example, [9, p. 27 – 28] recommends observing diversity according to four independent basic aspects, but in reality these may often overlap one another: workforce diversity, behavioural diversity, structural diversity, business diversity see also [5]. Hubbard [9, p. 27] defines diversity management as "The process of planning for, organizing, directing, and supporting these collective mixtures in a way that adds a measurable difference to organisational performance". In literature diversity management is understood as a systematic procedure used by companies when they decide to work with diversity and when they expect benefits based on such a strategic advantage [3], [2].

The development of the concept of diversity management from the affirmative actions (since the 1970s) up to broad use of diversity management in organizations (after the year 2000) is presented by, for instance, [18]. The concept of diversity management was originally associated with activities focusing only on the field of personnel management [12], [26], [8], only later the concept became an attitude perceived in a broader way. It is a concept realizing the diversity even outside companies and finally the concept was used more purposefully even in association with phenomena such as organization culture and corporate CSR. In connection with broader perception of the concept of

diversity management we can witness the emergence of national specific features, see for example [24], [15] or [14]. The above facts also relate to the widely accepted opinion that it would not very wise to adopt measures similar to the affirmative actions from the US.

It is important that there are partial studies proving the benefits of diversity management for organisations at the stage of its implementation [1], [7], [9], [26], [10] and the above stated study even highlights, on the example of some Danish companies, the relation of diversity of employees to the success of companies in the field of innovation.

2. Methodology of research

The purpose of the research study was to provide examples of successful diversity management implementations in large organizations with international participation and to describe these examples as case studies "best practices". Furthermore to analyse common characteristics of the examined implementations, even in its relation to Corporate Social responsibility (CSR) and also to present the specific diversity management activities as possible application in other companies in the Czech Republic. We drew on the realistic assumption that CSR [19] is becoming an integral part of the strategies of responsible companies and also on the preliminary research [5] that confirmed that large companies with international participation already implement diversity management even in the Czech Republic. The decision of the European Union about the requirement for gender balance in the management of large companies has also been a significant factor for our research. The main research question is as follows: What is the existing state of the implementation of diversity management in large organizations in the Czech Republic? The research study was carried out by the Department of Andragogy and Personnel Management of Faculty of Arts in Prague and the Department of Business Economics and Management of Faculty of Economics of University of West Bohemia in Pilsen (UWB) and was supported by the following research projects: Diversity management, comparison, the best practices of Visegrad countries (Visegrad Fund) and Research of the influence of monitoring, evaluation and prediction of the organization processes development on the overall performance (SGS-2012-028, UWB).

The method of case study was selected for the description and for better understanding of diversity management implementation in some selected organisations. The procedure is derived from [23], [4] and from the pilot project from the year 2009 [5]. The limited extent of this paper only enables to present just a selection from an extensive research and that is why in the four case studies below there is always some brief information about the company and CSR, a basic description of the attitude to diversity management and a selection of important and highlighted activities as related to diversity. The data for the case studies were collected namely from the web pages of the companies, annual reports and namely from the structured interviews with the responsible HR managers of the selected companies in the Czech Republic. The following characteristics were applied for the case selection: the organization belongs to large companies, it is part of a

multinational company, diversity management implementation and CSR application is confirmed by gaining international or national awards.

A brief description of four case studies is listed below. Other two case studies (IBM Delivery Centre Brno and Česká spořitelna a.s. see [6]) are presented only in a synoptic table. The set of the case studies involves one company from the field of telecommunication services, two companies from the field of food manufacture, one from the field of IT services and two companies from the field of banking. This way a certain extent of variety of the selected cases have been achieved from the point of view of the sector in which the organization is active.

3. Case studies

3.1 Application of diversity management in practice by the company T-Mobile Czech Republic, a. s. (join stock company – JSC)

The T-Mobile Czech Republic a.s. company belongs to the main mobile operators in the Czech Republic. It has been operating on the Czech market under the name of T-Mobile since the year 2003. The T-Mobile Czech Republic a.s. company provides mobile and land line telecommunication services, ICT services and satellite T-Mobile Television. It is part of Deutsche Telekom concern. Currently the company employs almost 3000 employees in the Czech Republic. The company entered the concept of social responsibility in the year 2005. The phenomena like the protection of the environment, assistance to the handicapped citizens, cooperation with non-profit organizations, fair business development, protection of children and such like belong to the primary monitored fields. The projects beneficial for various communities are promoted within the CSR field, the involvement of employees in donorship and volunteering is also supported. Diversity in the company is defined as respect to the individual and cultural diversity. Diversity is perceived as part of the company culture and as one of the important company values supported by the management. The company has developed a strategy for management in the field of diversity, whose aim is to achieve a well balanced diversity that would support the company prosperity (the so called balance of diversity) [25].

Examples of activities

Within the strategy of diversity management the company focuses on two basic fields of diversity. The first one is the support of equal opportunities, the so called “Fair Share”. The company implements programmes to support career growth for women, a well balanced age structure of teams and the involvement of handicapped persons in work. The company also initiates programmes for parents on maternity/parental leave, and assists them when they return after the maternity/parental leave. Last but not least, the company also supports the ethnical diversity of teams. Specific attention is paid to new employees and their coaching. The use of coaching was extended to all the company

employees. The second field that T-Mobile sees as important is the work-life balance. The company offers and extends the range of working and alternative loads. The diversity policy is communicated by means of various communication channels, including the magazine Echo or the Intranet web pages. Various activities are organized for managers, from conferences, through workshops ("Gender differences in the workplace") up to the activities from the field of work-life balance [25].

3.2 Application of diversity management in practice by the Kraft Foods CR Ltd. Company

The food company Kraft Foods CR Ltd. is part of a multinational company Kraft Foods International Inc. (KFI) with the head office in New York, USA. The company has been operating in the Czech Republic since 1992. It focuses on manufacture of biscuits and chocolate sweets. In the Czech Republic the company employs almost 700 employees. In the long-term the company implements projects falling in the field of social responsibility. Responsible behaviour does not apply only to business and building quality and favourite food brands. The company primarily deals in the fields such as healthy lifestyle, sustainable development and agricultural sources, ecological activities and contributions to local communities. The company was involved in the project "The Halfway house" or it aims to be of help by means of the organization called "A man in distress" and such like. In Kraft Foods diversity is defined as experience, perspectives and skills that make each employee unique. All differences between employees are respected. Diversity in the company includes both primary and secondary dimensions of diversity. The primary goal of the diversity strategy is to work with it within the relationships to customers, suppliers and colleagues and also to realize its significance. Diversity as perceived by Kraft Foods is not understood only as a one-time project or an independent activity but as a way. Within the diversity strategy the company aims at creating an inclusive organizational culture. HR as a business partner has a crucial role for diversity management in Kraft Foods as it supports diversity in the individual HR processes across all the company [17].

Examples of activities

The company supports diversity on the workplace by offering flexible working hours, the possibility of working from home, (after discussing this possibility with the relevant superior), reduced and part time workloads. In case of special projects the suitable workers are also offered special project workloads. The company also supports internal mobility at the local level and highlights the support of talents within Kraft Foods and uses the talent management at the international level. Career planning and the so called job commencement plans are also part of the company policy. Equal treatment in the company is supported by means of personnel processes, such as recruitment and selection of employees. Kraft Foods also monitors women representation in the management. Education and harmonizing work and private life is also part of the diversity attitude. In the company the global events focusing on healthy life style and the work-life balance within the project "Health and Wellness" are also organized.

3.3 Application of diversity management in practice by the Nestlé Česko Ltd. Company

Nestlé Česko Ltd. company belongs to the significant manufacturers of chocolate and non-chocolate sweets and it occupies one of the leading positions on the Czech food market. The company is part of the international food group Nestlé. In the year 2011 the company employed almost 2,000 employees.

The CSR concept in the company is perceived as a significant part of the company culture. In the CSR field the company has chosen the approach of the so called creation of the shared values built on the idea that for the long-term success of the company performance it is important that the values related to the business activities are brought not only to the shareholders but also to the community in which the company operates. Social responsibility is applied in the range from ethical standards up to responsible behaviour in the field of the environment and active support of the non-profit sector. The Nestlé company considers diversity management a competitive advantage. It has been dealing with diversity management since the year 2006. The company aims at setting such a culture that is more open and diversity focused and where the employees are considered to be the biggest asset regardless their gender, race or age. The company provides equal opportunities for development and career advancement to all their employees [20].

Examples of activities

Two priorities of diversity management were set in the company. The first one is the talent management and its link to diversity management, recognising talents without any prejudice and awarding any individuality, creating development plans and job commencement plans. The second, by no means a less important field, is the cooperation with parents on maternity leave and the system by which they return to work (the programme is called Cooperation during the maternity leave). The company maintains regular contact with parents on maternity/parental leave and it provides information about the developments in the company, about the projects and opportunities. The guided gradual integration of the mothers back into the company is also part of the programme. The process of returning back to work is also supported by adapting the workloads (usually reduced working hours in combination with work from home). Attention is also paid to the field aimed at harmonizing personal and professional life, alternative work modes, all of which was started as early as in the year 2006.

3.4 Application of diversity management in practice by the Komerční banka, a.s. (JSC)

Komerční banka, a.s. (KB) belongs to the three largest banks in the Czech Republic. It offers services in the field of retail, corporate and investment banking and other services, such as, for example, supplementary pension scheme, building saving, consumer credits and such like. KB is part of the international group Société Générale. Currently it employs almost 8,000 employees, out of whom more than 70% are women.

Social responsibility is integral part of the KB strategy and is understood as one of the key fields of the long-term success. Within the field of socially responsible behaviour the company supports projects aimed at the development of the civic society, support of education, projects of health and social character and projects focusing on the environment protection. KB considers diversity management to be a competitive advantage and that is why it also became integral part of the responsibilities of HR. The company applies a broad concept of diversity, both in its primary and secondary dimensions. Within diversity management the company focuses namely on the field of support of equal opportunities for specific groups of employees, namely the field of gender diversity and the field of harmonizing personal and professional life and talent development [16].

Examples of activities

Within the support of equal opportunities the company implements programmes aimed at specific groups of employees. It is, for example, employees on maternity/parental leave who the company helps to maintain contact with the bank, within the program for career guidance called Carmen (the aim of the programme is to enable equal career opportunities for all employees), and the organization also supports their faster and easier integration to workplace. KB also focuses on other specific groups of employees, such as employees 50+, the handicapped employees, graduates and students. Mentoring, in KB it is included in the programme called Talent management, is also applied in the field of gender diversity and within the support of women to help them develop their careers. In the field of harmonizing personal and professional life (work-life balance) the company actively supports alternative workloads (flexible working hours, part time jobs, work from home, hot-desking and such like).

4. Comparison of the monitored characteristics of diversity management implementation

The table on the next page brings the main monitored characteristics of the implemented case studies. Their purpose is to highlight the proven approaches of diversity management implementation in the Czech Republic for their adequate use in other, medium sized and small businesses in the Czech Republic.

Conclusion

Economic, social and cultural changes in the Czech Republic make diversity management necessity for companies that want to thrive in the current highly competitive and uncertain business environment. In connection with the strategy of the EU and the Czech Republic and their orientation to innovation it is necessary to realize that the innovation potential is formed primarily by people as the bearers of this knowledge but this knowledge comes into existence more and more in cooperation with other co-workers in diversity teams. „Employee diversity is often considered to be positive since it might

Tab. 1 Characteristics of diversity management implementation

Monitored characteristics	**T-Mobile Czech Republic, a.s. (JSC)**	**Kraft Foods CR Ltd.**	**Nestlé Česko Ltd.**	**Komerční banka, a.s. (JSC)**	**IBM ID Centre Brno**	**Česká spořitelna, a.s. (Czech Savings bank, JSC)**
CSR line: people	company philanthropy, support of communities, employees involvement	support of necessary social groups, charity	shared values principle	civic society development charity, volunteering, equal opportunities	educational programs, gender issues, company volunteering	equal opportunities company volunteering, employees involvement, charity
Diversity integration into organisational culture	diversity as part and value of org. culture	inclusive organisational culture	open diversity culture	equal opportunities respect to individuality as values of org. culture	respect and openness as org. culture values	equal opportunities, mutual respect, as part of org. culture
Diversity strategy	YES	YES	YES	YES	YES	YES
Diversity aspects and their integration						
Workforce Diversity	full Integration	full integration	full integration	full integration	full integration	full integration
Behavioural Diversity	partial integration	partial integration	partial integration	full integration	full integration	partial integration
Structural Diversity	partial integration	full Integration	full integration	full integration	full integration	full integration
Business Diversity	full integration	full integration	full integration	full integration	full integration	full integration
Defining fields of diversity management	equal opportunities „Fair Share", work-life balance	talent diversity, work-life balance, equal opportunities	talent diversity, support of parents on maternity/ paternal leave, work-life balance	equal opportunities for specific groups, work-life balance, support of talents	gender diversity, people with disabilities, cultural adaptability, work-life balance	equal opportunities- gender, age and nationality diversity, harmonizing work and family
Awards related to CSR and diversity	**T-Mobile YES** e.g. 2010 and 2012 – 2nd place in Company of the year – equal opportunities, 2011 – Top responsible company award					
	Kraft Foods YES e.g. 2009 – Best Social Responsibility Practice award, Woman Engineer Magazine award for proactive approach to employed women					
	Nestle Česko YES e.g. 2012 – competition Top responsible company – 2nd place – Workplace of the future					
	Komerční banka YES 2008 – 3rd place in the competition Company of the year: Equal opportunities, 2012 – title The most desirable employer of the decade					
	IBM ID Centre Brno YES 2008, 2009 a 2010 – 1st, 2nd and 3rd places in the competition Company of the year: Equal opportunities					
	Česká spořitelna YES e.g. 2011 – 1st place in the competition Company of the year: Equal opportunities, 2011 – title Workplace of the future in the competition Top responsible company					

Source: own processing

create a broader search space and make the firm more open towards new ideas and more creativity. Ideally, diversity should increase a firm's knowledge base and increase the interaction between different types of competences and knowledge." [21]. Therefore employee diversity cannot be ignored in the relation to the innovation capabilities of organization [13]. Consequently, workforce diversity may be considered as one of the prerequisites for successful company innovations.

The presented case studies provide insight in the nature of successful diversity management implementation and offer a helpful way how to apply diversity policies and programmes in other companies. The results of the research indicate that companies promote diversity as a business case as well as social responsibility. Furthermore, the findings support the necessity to have diversity strategy and to adopt proactive approach to managing diversity with the aim to create an organization environment in which all employees can contribute and reach their full potential.

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Competitive Strategy Decision Making Based on the Five Forces Analysis with AHP/ANP Approach

Abstract

The paper deals with a strategy making process on an example of high-tech firm. The strategy making process is the key task of any organization but especially in the fast changing environment of a high-tech firms it is crucial to also look ahead be able to differentiate the strategy approach. The strategic thinking is a structured decision making process that requires an assessment and evaluation of a large number of factors, criteria and data. When dealing with innovative approaches to decision making and strategic thinking it is necessary to follow a standardized structure. Contemporary knowledge society is determined by scattered information that can be accessed by a large number of subjects. This gives a great possibility to an independent subject to gather large intelligence about the business environment and all other related issues. This large quantity of information has to be structured in a hierarchical manner with interrelations. Even with this access to extensive intelligence the decision making process is always biased by some degree of subjectivity because it is made by people even with high competency. The paper presents an approach to strategic decision making process that uses well known Porter's Five Forces Analysis amplified by application of multiple attribute decision making decomposition methods Analytic Hierarchy Process and Analytic Network Process. The aim of the paper is to present both methods and compare the results of the competitive strategy decision making process using these methods also with the traditional approach. The first part of this paper includes an introduction to the strategic decision making and five forces analysis. The next part deals with multiple attribute decision making methods especially with the AHP and ANP with short review of up to date references. Following part is concerned with the methodology and general approach. The results are presented in the final part together with discussion and further applications.

Key Words

AHP, ANP, Five Forces Analysis, multiple attribute decision making, strategic management, strategic decision making

JEL Classification: M10, C44

Introduction

Contemporary business environment is facing a very challenging period. The levels of uncertainty are changing but they still seem to have and upward trend. Businesses are having a difficult period when long term strategies are hard to establish. Large numbers of firms have their own vision and mission but means of getting towards them are hard to implement. Strategic thinking has to adapt. It is necessary to evaluate more variables

then before but at the same time the schedules and resources are stretched and product cycles are also getting shorter. Larger companies have the upper hand in this resource based competition and thus smaller firms have to look for affordable services or have to cooperate in order to compete. This is getting common in all aspects of the business life.

The purpose of this paper is to implement AHP and ANP methods within the Five Forces Analysis framework and show its implication for strategic decision making. Presented approach is illustrated on a decision making problem of a high-tech manufacturing company, see [19], [23].

1. Literature review

Scholars in [4], [7], [18] have given evidence that business environment is going through a period of development of the knowledge society that has influenced decision making processes of firms, organizations and individuals. However many important strategic decisions are made on the basis of self evidence, intuition and not fully comprehend relationships among evaluated criteria. In recent years there has been a shift towards more frequent use of decision support tools and methods see [17]. Unfortunately their implementation is still not widespread among small and medium-sized companies. There have been efforts to implement more innovative tools to firms but they are mostly used for supportive tasks not for actual decision making [7]. However, small and medium sized firms do not have to purchase expensive software or implement sophisticated decision support processes but just understand some basic decision making methods that can help to make their work more effective. Among the most practical and useful Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) can be named. These methods represent a group of decomposition multiple attribute decision making approaches that were developed by Saaty, see [11], [12], [13].

There is little doubt that contemporary economy and entrepreneurial environment is going through a very turbulent time [14]. There is a constant need for evaluation and assessment of vast number of key business elements [16]. Businesses are pushed for faster innovation as the product and service life cycles are shortening especially in the industrial sector [1]. In order to face such critical period firms have to be aware of their competitive position. It is not necessary to investigate complicated approaches just to focus on those that can be adapted to any business environment and case such as well known Porter's Five Forces Analysis see [8], [9]. Application this analysis leads to strategic decision making where three main strategies can be differentiated: cost leadership, differentiation and focus. Recently there have been numerous application of such strategic analyses combined with decision making methods in [2], [3], [10], [13] with practical results. Some of these cases were also combined with a use of specialized software for AHP/ANP decision making. This paper focuses on ordinary use that can be performed using MS Office software.

2. Strategic decision making

Strategic decision making is a tool for steering the company towards its vision and long term goals. Medium-sized or small firms have to use this instrument as effective as possible. Hence they do not possess resources that can be allocated to a larger number of efforts made towards the strategy development and implementation. They should select one or two alternative scenarios of strategic development to follow. Therefore allocation of resources plays a crucial part of their strategic management.

All businesses must be able to evaluate their competitive market position. There are several instruments that can be employed. To assess the competitive position from a competitive advantage perspective Porter [8] have developed the Five Forces analysis that helps a firm to understand its business environment in relation to current competitors, its customers, suppliers, substitute products and threats of a new competition. Based on this analysis the firm can develop strategies that would be more appropriate for future situation of the competitive environment.

In developing the five forces model Porter [8] and [9] applied microeconomic principles to business strategy and analyzed the strategic requirements of industrial sectors, not just specific companies. The five forces are competitive factors which determine industry competition and include: suppliers, rivalry within an industry, substitute products, customers or buyers, and new entrants. Although the strength of each force can vary from industry to industry, the forces, when considered together, determine long-term profitability within the specific industrial sector. The strength of each force is a separate function of the industry structure, which Porter defines as "the underlying economic and technical characteristics of an industry." Collectively, the five forces affect prices, necessary investment for competitiveness, market share, potential profits, profit margins, and industry volume. The key to the model is to analyze continuous dynamics within and between the five forces. The model's specific characteristics are advantageous towards multiple attribute decision making approach.

3. Multi level decomposition decision making methods

The fundamental advantages of multi-criteria decision making methods can be found in the decision maker's ability to evaluate each alternative using a large number of criteria. Alternatives are the possible courses of action in a decision problem. It is important that every attempt is made for the development of all possible alternatives. Failure to do so may result in selecting an alternative for implementation that is inferior to other unexplored ones. Attributes are the traits, characteristics, qualities, or performance parameters of the alternatives. Attributes, from the decision making point of view, are the descriptors of the alternatives. For MADM, attributes usually form the evaluation criteria. Criteria (Evaluation) can be perceived as the rules of acceptability or standards of judgment for the alternatives. Therefore, criteria encompass attributes, goals, and objectives.

3.1 Description and methodology of the Analytic Hierarchy Process (AHP)

The problem of multiple attribute evaluation of alternatives is foremost a task of finding of optimal (best) alternative and raking of these alternatives from the best to the worst plausible. In short it is the optimization problem. Decomposing multiple attribute methods are well suited for evaluation of finite number of alternatives. One the most widely used methods is the Analytic Hierarchy Process. The theoretical procedure of the AHP method consists of four steps: (i) hierarchy design (goal definition, identification of alternatives, identification of evaluation factors, assignment of criteria and factor relationships and finishing of the hierarchy), (ii) identification of priorities (application of pair-wise comparison, point evaluation of significance, repeating of the procedure for all hierarchy levels), (iii) combination and (iv) evaluation (weighted values of alternative solutions). Simultaneously with the creation of structured hierarchy a system of criteria groups (sub-criteria) and alternatives. The most widely employed illustration of the hierarchy is a diagram. The Saaty's method of pair-wise comparison [11] has to be applied on each level of the hierarchy structure. The first level of the hierarchy is the goal of the evaluation (selection of the best alternative, rank of alternatives, etc.). The second level of the hierarchy represents evaluation criteria (the goal of the evaluation depends on which evaluation criteria will be used). The third level of the hierarchy is made of evaluation sub-criteria. And finally the fourth level of the hierarchy includes alternatives which utility depends on their relationship towards evaluation criteria and sub-criteria. Saaty approach deals with the notion that human perception of the decision making problem can be hierarchically structured in order to minimize the scope of criteria comparisons to the suggested limit of 7. It is also best to use proposed comparison scale for the pair-wise comparison matrixes see Tab. 1.

Tab. 1 Saaty's comparison fundamental scale

Degree	Descriptor
1	Criteria *i* and *j* are equal
3	Low preference of criteria *i* before *j*
5	Strong preference of criteria *i* before *j*
7	Very strong preference of criteria *i* before *j*
9	Absolute preference of criteria *i* before *j*
2, 4, 6, 8	Medium values for more precise preference determination.

Source: see [11]

The rank of alternatives and selection of the optimal one is based on weighted sum criteria (total weighted utility) of the alternative. Then for the weighted sum criteria of normalized weights following formula can be applied:

$$U(a_i) = \sum_{j=1}^{m} w_j \cdot x_{i,j}, \tag{1}$$

where x_{ij} represents the evaluation of the *i*th alternative according to the *j*th criterion. the w_j represents the normalized weight of the *j*th criteria. The weights w_j can be obtained through an algorithm based on the geometric mean method (method of least logarithmic squares) under the same necessary condition then the solution is a normalized geometrical mean of the matrix as follows

$$w_i = \frac{\left[\prod_{j=1}^{k} s_{ij}\right]^{1/k}}{\sum_{i=1}^{k}\left[\prod_{j=1}^{k} s_{ij}\right]^{1/k}}, \text{ for } i = 1,\ldots,k \quad (2)$$

The geometrical mean can be calculated using MS Excel function *GEOMEAN*. This function will be employed for calculations in the application part. In the AHP method, decision makers or experts who make judgments or preferences must go through the consistency test. In order to determine that if the judgment of the respondents satisfies the consistency, which are conducted based on the consistency ratios (*CR*) of the comparison matrixes. *CR* is calculated using following formulas:

$$CI = \frac{(\lambda_{\max} - n)}{(n-1)} \quad (3)$$

$$CR = \frac{CI}{RCI} \quad (4)$$

where *RCI* is a random index [11] . When $CR \leq 0.1$, it can be regarded as the valuation process satisfies the consistency. To calculate *CR* it is necessary to calculate the consistency index *CI* first. If CI = 0, satisfies the consistency. If $CI > 0$, means the experts have conflicting judgments. If $CI \leq 0.1$, a reasonable level of consistency. The practical AHP procedure consist of: (i) creation of the hierarchy, weight quantification for each criteria (sub-criteria), (ii) comparison of alternatives according to identified criteria, analysis of consistency (C.R.) and (iii) finding of the optimal alternative (with the highest value of utility function $U(a_i)$).

3.2 Description and methodology of the Analytic Network Process (ANP)

The ANP structures the problem related to options in reverse logistics in a hierarchical form. With the ANP, the interdependencies among criteria, sub-criteria and determinants for the options can be considered. The original analytical network process (ANP) was proposed in [12]. ANP is the extension of analytic hierarchy process (AHP) and is a more general form of AHP. ANP can involve the representation of relationships hierarchically, but it does not need as strict a hierarchical structure as AHP. Many decision problems cannot be structured hierarchically because they involve the interaction and dependence of higher level elements on low level elements. Saaty in [12] applied ANP to handle dependence among criteria and alternatives without assuming independent decision criteria. The ANP feedback approach replaces hierarchies with networks, and emphasizes interdependent relationships among various decision-making also interdependencies among the decision criteria and permit more systematic analysis. For pair-wise comparison Saaty's comparison fundamental scale is widely considered as a default, see Table 1. The ANP uses the "supermatrix" to performance the relationships of criteria and the degree of importance. The supermatrix *W* can be observed in (5). To obtain global priorities in a system with interdependencies, the

supermatrix lists down all the sub-matrixes consisting of all criteria and necessary elements. They are put in order on the left and upper sides of the matrix, where W_{ij} represents all possible and logical pair-wise comparisons as follows:

$$W = \begin{matrix} goal \\ criteria \\ sub-criteria \\ alternatives \end{matrix} \begin{bmatrix} W_{11} & \cdots & \cdots & W_{1n} \\ W_{21} & W_{ij} & \cdots & W_{2n} \\ \vdots & \cdots & \cdots & \vdots \\ W_{n1} & W_{n2} \cdots & W_{n(n-1)} & W_{n,n} \end{bmatrix} \tag{5}$$

For calculation of limited supermatrices of the noncyclical ANP according to [13] can be applied:

$$\overline{W}^{\infty} = \lim_{k \to \infty} \overline{W}^{k} \tag{6}$$

where $\overline{W}^{\infty}$ is the limited supermatrix, $\overline{W}^{k}$ is the supermatrix without a cycle powered k-times. In the case of the cyclic matrix following formula should be applied [13]:

$$\overline{W}^{N} = \frac{1}{N} \sum_{k}^{N} \overline{W^{k}} \tag{7}$$

4. Five Forces Analysis with strategic decision making using AHP and ANP

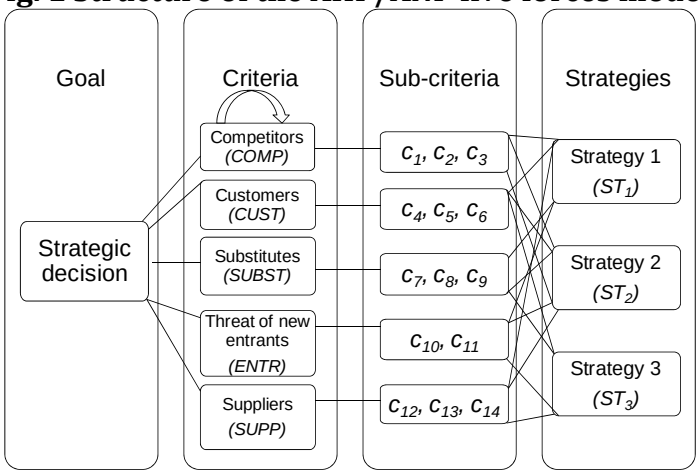
The proposed framework utilizes Porter's five competitive forces as shows Fig. 2. According to this structure, the relative importance of the competitive forces (criteria) in terms of their influence on market performance and competitive advantage of the firm (goal), and the relative importance of the competitive market strategies (alternatives) with respect to the competitive forces must be acquired through performing pair wise comparisons by asking the following questions, respectively: Which competitive force has more impact on the firm's market performance and competitive advantage, and how much more? Which competitive market strategy is more dominant with respect to impeding a particular competitive force, and how much more?

4.1 Model design

The difference between AHP and ANP approach resides in the structure where the characteristic ANP loop (feedback) is missing in the AHP model. Based on the structure on the Figure 1 both methods were applied and results calculated. The procedure of the AHP/ANP model application involves 7 steps that begin with the actual five forces analysis and ends with strategic decision: (i) five forces analysis of the business environment; (ii) creation of a structured decision making model with 5 criteria and relevant sub-criteria; (iii) pair-wise comparisons using Saaty method and pair-wise comparison matrices; (iv) application of the AHP, calculation of weights and utility

function; (v) pair-wise comparison of criteria with regard to each criteria; (vi) creation of ANP supermatrix and calculation of the limited supermatrix; (vii) comparison of AHP and ANP results and strategic decision.

Fig. 1 Structure of the AHP/ANP five forces model



Source: own elaboration.

4.2 Application of the model on a case study

The decision-making criteria were identified in particular forces and were available for actual analysis. The data about the monitored company were taken from following sources [19], [20], [21], [22], [23]. The five forces analysis has identified 14 criteria (c_1,...,c_{14}) and three generic strategies (ST_1, ST_2, ST_3, resp. cost leadership, differentiation and focus). The goal of the following AHP method is the strategic decision making between proposed strategies. All criteria were pair-wise compared and weights have been calculated. Next the utility function $U_1(a_i)$ was estimated as shown on the Tab. 2.

Tab. 2 Utility function estimation by AHP

Criteria	c_1	c_2	c_3	c_4	c_5	c_6	c_7	c_8	c_9	c_{10}	c_{11}	c_{12}	c_{13}	c_{14}	$U_1(a_i)$
Weights	0.292	0.070	0.101	0.127	0.052	0.021	0.037	0.059	0.016	0.044	0.015	0.100	0.033	0.033	
ST_1	0.661	0.466	0.143	0.140	0.128	0.359	0.687	0.113	0.405	0.630	0.117	0.709	0.637	0.558	*0.450*
ST_2	0.208	0.433	0.286	0.333	0.276	0.517	0.127	0.379	0.481	0.151	0.268	0.113	0.105	0.122	*0.251*
ST_3	0.131	0.100	0.571	0.528	0.595	0.124	0.186	0.508	0.114	0.218	0.614	0.179	0.258	0.320	*0.298*

Criteria	c_1	c_2	c_3	c_4	c_5	c_6	c_7	c_8	c_9	c_{10}	c_{11}	c_{12}	c_{13}	c_{14}	$U_1(a_i)$
Equal Weights	0.126	0.030	0.044	0.127	0.052	0.021	0.067	0.106	0.028	0.150	0.050	0.120	0.040	0.040	
ST_1	0.661	0.466	0.143	0.140	0.128	0.359	0.687	0.113	0.405	0.630	0.117	0.709	0.637	0.558	*0.438*
ST_2	0.208	0.433	0.286	0.333	0.276	0.517	0.127	0.379	0.481	0.151	0.268	0.113	0.105	0.122	*0.240*
ST_3	0.131	0.100	0.571	0.528	0.595	0.124	0.186	0.508	0.114	0.218	0.614	0.179	0.258	0.320	*0.322*

Source: own elaboration.

The results were compared with utility function $U_2(a_i)$ that was using equal weights among Porter's five forces. Decision making criteria according to Five forces model:

- Competitors: market share (c_1), product range(c_2), distribution channels (c_3);

- Customers: relationship with current customers (c_4), customer sensitivity on changes and quality of products and services (c_5), potential of new customers (c_6);
- Substitutes: quality of substitutes (c_7), availability of substitutes (c_8), upcoming substitutes (c_9);
- Threat of new entrants: estimated costs of entrance to the market (c_9), other barriers to the entrance (c_{10});
- Suppliers: costs of raw materials (c_{11}), currency risk (c_{12}), reliability of suppliers (c_{13}).

The following Tab. 3 shows weighted supermatrix used for ANP method. This matrix has to be normalized and the calculated in iterations using (7).

Tab. 3 Unweighted supermatrix for ANP method

	GOAL	COMP	CUST	SUBST	ENTR	SUPP	c_1	c_2	c_3	c_4	c_5	c_6	c_7	c_8	c_9	c_{10}	c_{11}	c_{12}	c_{13}	c_{14}	ST_1	ST_2	ST_3
GOAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP	0.464	1.000	0.196	0.292	0.517	0.294	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.464	0.464	0.464
CUST	0.200	0.306	1.000	0.146	0.238	0.137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.200	0.200	0.200
SUBST	0.112	0.087	0.435	1.000	0.077	0.069	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.112	0.112	0.112
ENTR	0.058	0.466	0.299	0.471	1.000	0.500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.058	0.058	0.058
SUPP	0.166	0.140	0.070	0.091	0.168	1.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.166	0.166	0.166
c_1	0	0.630	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.479	0.595	0.230
c_2	0	0.152	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0	0	0	0	0.380	0.128	0.122
c_3	0	0.218	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0	0	0	0.140	0.276	0.648
c_4	0	0	0.637	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0	0	0.184	0.600	0.400
c_5	0	0	0.258	0	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0	0.584	0.200	0.200
c_6	0	0	0.105	0	0	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0	0.232	0.200	0.400
c_7	0	0	0	0.332	0	0	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0	0.605	0.582	0.332
c_8	0	0	0	0.528	0	0	0	0	0	0	0	0	0	1.000	0	0	0	0	0	0	0.291	0.109	0.528
c_9	0	0	0	0.140	0	0	0	0	0	0	0	0	0		1.000	0	0	0	0	0	0.105	0.309	0.140
c_{10}	0	0	0	0	0.750	0	0	0	0	0	0	0	0	0	0	1.000	0	0	0	0	0.250	0.833	0.750
c_{11}	0	0	0	0	0.250	0	0	0	0	0	0	0	0	0	0		1.000	0	0	0	0.750	0.167	0.250
c_{12}	0	0	0	0	0	0.600	0	0	0	0	0	0	0	0	0	0	0	1.000	0	0	0.582	0.168	0.600
c_{13}	0	0	0	0	0	0.200	0	0	0	0	0	0	0	0	0	0	0	0	1.000	0	0.109	0.484	0.200
c_{14}	0	0	0	0	0	0.200	0	0	0	0	0	0	0	0	0	0	0	0	0	1.000	0.309	0.349	0.200
ST_1	0	0	0	0	0	0	0.661	0.466	0.143	0.140	0.128	0.359	0.687	0.113	0.405	0.630	0.117	0.709	0.637	0.558	1.000	0	0
ST_2	0	0	0	0	0	0	0.208	0.433	0.286	0.333	0.276	0.517	0.127	0.379	0.481	0.151	0.268	0.113	0.105	0.122	0	1.000	0
ST_3	0	0	0	0	0	0	0.131	0.100	0.571	0.528	0.595	0.124	0.186	0.508	0.114	0.218	0.614	0.179	0.258	0.320	0	0	1.000

Source: own elaboration.

Following Tab. 4 shows weights calculated by AHP and ANP methods. It can be seen that results are very similar and thus confirm that based on expert pair-wise comparisons there is a difference among courses of actions with regard to the strategic decision.

Tab. 4 Local and global priorities of criteria estimated using AHP and ANP methods

Five forces AHP						Five forces ANP				
Criteria	Criteria priorities	Sub-criteria	Local priorities	Global priories	Equal criteria priorities	Criteria	Criteria priorities	Sub-criteria	Global priorities	Local priorities
COMP	0.464	c_1	0.630	0.292	0.126	**COMP**	0.342	c_1	0.058	0.479
		c_2	0.151	0.070	0.030			c_2	0.026	0.214
		c_3	0.218	0.101	0.044			c_3	0.037	0.307
CUST	0.200	c_4	0.637	0.127	0.127	**CUST**	0.195	c_4	0.044	0.402
		c_5	0.258	0.052	0.052			c_5	0.038	0.348
		c_6	0.105	0.021	0.021			c_6	0.027	0.250
SUBST	0.112	c_7	0.333	0.037	0.067	**SUBST**	0.126	c_7	0.050	0.491
		c_8	0.528	0.059	0.106			c_8	0.035	0.345
		c_9	0.140	0.016	0.028			c_9	0.017	0.164
ENTR	0.058	c_{10}	0.750	0.044	0.150	**ENTR**	0.202	c_{10}	0.064	0.588
		c_{11}	0.250	0.015	0.050			c_{11}	0.045	0.412
SUPP	0.166	c_{12}	0.600	0.100	0.120	**SUPP**	0.137	c_{12}	0.052	0.499
		c_{13}	0.200	0.033	0.040			c_{13}	0.023	0.227
		c_{14}	0.200	0.033	0.040			c_{14}	0.028	0.274

Source: own elaboration.

There are no significant differences in priorities of model criteria. Estimated priorities from both methods are similar. Some difference can be perceived in the relative distribution of priorities but not in the overall ranking. Following Tab. 5 includes comparison of results for strategy decision making problem. Based on those results we can decide which strategy is more preferred based on expert (even subjective) opinion using AHP and ANP approaches. The strategy that has the highest value of utility is the cost leadership (low cost strategy with sustainable quality).

Tab. 5 Comparison of AHP and ANP results of the strategic decision making

Alternative generic strategies		**ANP priorities**	**AHP $U_1(a_i)$**	**AHP $U_2(a_i)$**
Low-cost strategy with sustainable quality	**ST_1**	0.431	0.450	0.438
Differentiation strategy to enhance the brand and address new customers	**ST_2**	0.247	0.251	0.240
Strategy of focus on high-tech products to gain and sustain technical superiority	**ST_3**	0.322	0.298	0.322

Source: own elaboration.

Conclusion

Proposed model of Porter's five forces analysis combined with decomposition multiple attribute decision making methods AHP and ANP enhances the original model with structured decision making hierarchy and process. The application can be developed further and could include more variables, levels (internal and external, industry and firm) and quantitative data. Illustrative case has shown that even simple AHP method can be applied. However the ANP approach gives more opportunities to put interrelation across selected criteria and sub-criteria. Another advantage of the ANP is also the supermatrix approach that describes relations among criteria and alternatives (strategies) better than sole AHP tables. On the other hand AHP can be also solved using supermatrix.

There are many decision making software available for strategic decision support. The main disadvantage in comparison with presented approach is their rigidness. In this case it is possible to change specification of the model, add more perspectives, factors, etc. After short tutorial managers should be able to use this model tool and apply it on ordinary decision-making tasks. Less complicated cases can be solved quickly using programmed sheets with AHP in MS Excel. Further research is expected into other strategic decision making processes in management models with application of other MADM methods and their combinations.

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FDI as a Source of Patent Activity in V4

Abstract

The foreign direct investment (FDI) have played an irreplaceable role during the transformation processes in Visegrad Four (V4) countries contributing to successful transition from central planned to market-based economy system, bringing new technologies, capital sources, know-how in many areas leading to higher productivity and above average economic growth, and they contributed to increasing competitiveness. The current challenges these economies face are twofold – first, it is a need for a strategic shift from the growth and competitiveness fuelled very much by the low cost labour force to a qualitatively new model based on creative and knowledge based aspects; second, it is an overall economic downturn, which affects smaller and open economies very significantly, since they are still dependant on external sources of growth like foreign demand. Generally, in the current fragile economic situation around the globe the innovative approach is seen as a chance for recovery bringing new effective solutions for companies, households and even states, more over it can also contribute to tackle global challenges. Despite the general tendency of research outcomes towards more complex and sophisticated composite indexes measuring competitiveness and innovations, the paper is focused on examining and testing of selected input and output indicators, namely FDI and their influence on the dynamics of patent indicators, namely total FDI inward stocks to the region and number of patent applications. The paper particularly analysis the relation of FDI inward stocks coming to the V4 region from the 15 most innovative countries according to the Global Innovation Index 2012 and the number of patent applications during the years 200-2010.

Key Words

foreign direct investment, competitiveness, innovation, patent, Visegrad Four, Czech Republic

JEL Classification: O31, F21, P3

Introduction

In the theoretical literature on innovations, a number of studies have examined how FDI is accompanied by interregional spillovers of knowledge from the more to the less advanced country. Such studies include those Walz [31], Cheung [4], Calliano and Carpano [2]. Sourafel and Holger [26] conducted by using conditional quantile regression the evidence for a u-shaped relationship between productivity growth and FDI interacted with absorptive capacity. Timothy [27] found that FDI in neighbouring states has just as strong an impact on patent rates and that knowledge can spill across state borders. Using survey studies and econometric studies Benacek et al. [1] concluded that the presence of foreign firms has increased productivity levels in Central Europe,

but only to a limited degree. Within a semi-endogenous growth model Neuhaus's book [20] illustrates the impact of FDI on economic growth for every stage of development of a country with special attention to the countries of Central and Eastern Europe.

Several researchers have examined performance of foreign-invested firms in the Czech Republic. Kinoshita [16] examines the effects of R&D (innovation and development of absorptive or learning capacity) and technology spillovers from FDI on a firm's productivity growth. The study of Hamplová and Provazníková [12] analyzed the most frequent motives why FDI enter the Czech Republic and Hlaváček [13] cautions against the concentration of the direct foreign investments that are more dependent on the economic cycle. Despite the large body of research examining the determinants and impacts of FDI, there is a lack of knowledge with respect to the linkage between the origin of FDI and its absorption. There is robust evidence that economic growth; productivity and development are significantly induced by innovations, which significantly contribute to competitiveness. [21, 22]. And in the current very fragile economic situation around the globe the innovative approach is seen as a chance for recovery bringing new effective solutions for companies, households and even states, more over it can also contribute to tackle global challenges (e.g. developing green technologies).

Competitiveness can be described as an ability of a long-term growth [17]. The World Economic Forum (WEF) defines the term as "the set of institutions, policies, and factors that determine the level of productivity of a country" [24]. According to Porter, innovations speed up process of productivity growth and productivity is essential for achieving a competitive advantage. [23] According to OECD[1], there are innovations of products, processes, marketing and organisational methods[2], which is an enhancement of TPP[3] concept into service sector, which reflects a growing share of investments in knowledge-based capital as well as the role of knowledge flows. Innovations are seen as a substantial improvement or they can be new in relation to a company, to the market or completely new (to the world), and they are rather a continuous process than only a result aiming at increasing productivity and performance. Although innovations are not limited to any sector, measurement in public sector is still in the progress. [21, 22]

In both cases, at national or European level, there is a common long term goal interconnecting almost all fields of economic and related policies and it is – increasing standard of living of citizens in a sustainable manner. At the European level a main strategic document is Europe 2020, which is a 10-year strategy for smart[4], sustainable and inclusive growth, where research and innovation is among 5 key targets[5] with a goal: 3 % of the EU's GDP to be allocated in R&D to catch up the best [7]. The strategy

[1] See more OECD's Oslo Manual for measuring innovation developed together with Eurostat. Another important source is Frascati Manual, Canberra Manual, Patent Manual and others.

[2] In business process, workplace, external relations.

[3] Technological product and process innovations in manufacturing were complemented by non-technical ones.

[4] It includes following areas: education; research/innovations; digital society.

[5] The others are: employment; education; social inclusion and poverty reduction; climate and energy.

expects the goals to be reflected in national targets and introduces 7 flagship initiatives providing further framework for coordinated efforts. One of them is Innovation Union with more than 30 action points aiming at increasing science performance, improving conditions for innovations and introduction of Innovation Partnership for effective cooperation between private and commercial sector; while shifting the focus to solutions of important societal challenges (e.g. climate, energy etc.) [8]. In case of the Czech Republic, the strategic framework is composed of Strategy[1] of International Competitiveness for period 2012 – 2020 (SIC) and National Innovation Strategy as a part of SIC and was issued as a separate document related to the Innovation Union, which is Europe 2020 Initiative, and of the National policy of research, development and innovations for years 2009 – 2015[2]. The goal set by SIC is to be among the 20 most competitive economies measured by GCI by the year 2020 [30]. The basic means is a shift from a growth model based on cheap labour force to economy driven by entrepreneurship and innovation and based on quality institutions, infrastructure and effective usage of labour force potential [30]. FDI will still play an important role, but the stress will be shifted to entrepreneurship and knowledge. [30, 17, 18]

1. Measuring Innovations and Competitiveness

In times of austerity and increasing competition, innovations become inevitable for businesses and for states as well. Thus, it is important also to assess results and effectiveness of funds allocated and policies designed and implemented including a direct comparison with others in terms of success and dynamics [21, 22]

Among the key sources of methodology and data on science, research and innovation belongs the OECD with its ongoing process of more than 50 years of development of measuring tools, closely cooperating with Eurostat. Additional important sources on competitiveness including aspects of R&D and innovations are World Bank, World Economic Forum and International Institute for Management Development (IMD). OECD in its document Measuring Innovation: A New Perspective, which accompanies the OECD Innovation Strategy[3], uses traditional indicators complemented by newly developed, but points at significant gaps and inadequacies in several areas, which need to be addressed in the future. [21, 22]

The Innovation Union Scoreboard (IUS) represents a measuring tool[4] of the EU for comparison of innovation performance within EU 27 and 17 non-member countries [9]. The IUS is accompanied by Regional Innovation Scoreboard [10] and Regional Innovation Monitor, which provides information on innovation policy in all EU regions.

[1] It is based on the Framework for the Strategy of Competitiveness and Analysis of Competitiveness.

[2] It relates to other interdepartmental conceptions focused on R&D and innovations, sectoral conceptions of applied R&D, and special studies [28].

[3] The strategy provides a practical guidance for governments to prepare and implement national innovation strategies and policies.

[4] It is based on previous European Innovation Scoreboard [9].

The fifth edition of the Global Innovation Index (GII) Report is as a result of cooperation of the INSEAD and the World Intellectual Property Organization (WIPO) with research support of the Joint Research Centre (JRC) and covers 141 countries and 84 indicators. [6] Among the most important comparison instruments incorporating innovation agenda into the core of even more complex evaluation of competitiveness is the well-known WEF's Global Competitiveness Index (GCI) covering 144 countries [24].

Except from GCI, the WEF prepares also the Europe 2020 Competitiveness Report, which is a biannual study (published in 2012 for the first time) covering EU27 + 6 accession and candidate states, where as all V4 countries belong to the 3rd tier group (out of 4) according their competitive performance. [32] The IMD World Competitiveness Yearbook (WCY) is published since 1989 and its last edition from 2012 compares 59 countries and takes into account 329 indicators classified in 4 groups: Economic Performance (78 criteria); Government Efficiency (70 criteria); Business Efficiency (67 criteria); Infrastructure (114 criteria). [14] Worth to mention are the World Bank's Knowledge Index composed of Education, Innovation and ICT Indexes, and the broader Knowledge Economy Index including also Economic and Institution Regime Index and European Regional Competitiveness Index – based on GCI, but it is adjusted. [33]

2. Methodology

The geographical range of the article covers V4 region, namely the Czech Republic, Slovakia, Poland, Hungary, which belong to the new EU member countries, sharing a communist area history, and facing similar problems as a result of transition from central planned to market based economies and catching up processes. As a previous preview of the most important studies has shown they are also comparable in terms of competitive performance and related challenges.

Despite the general tendency of research outcomes towards more complex and sophisticated composite indexes, the paper is focused on examining and testing of selected input and output indicators, namely Foreign Direct Investment and their influence on the dynamics of patent indicators. Patent statistics belongs to traditional tools of measuring Science and Technology (S&T) together with R&D expenditures. Although often used for measuring output of research, it faces certain limitations (e.g. it does not cover all inventions, differences in economic or technological value of patents). On the other hand indicators of Foreign Direct Investment are often included among framework conditions related to macroeconomic environment and its prospects or among those indicators allowing and contributing to higher competitiveness. So, on one side they reflect overall attractiveness of country or particular location and simultaneously they contribute to this attractiveness by their presence and also by participating in knowledge diffusions.

In both cases, the paper will use as a main source of data Eurostat statistics in order to maintain mutual compatibility. The period will cover years 2000 – 2010. The time series face ordinary limits related to availability of data, e.g. FDI statistics as of 29.03.2013

includes the year 2011, but patent applications only 2010, or not available data[1] for certain year.

Since another common feature of V4 countries is the level of openness of economies and importance of foreign direct investment on employment, productivity, export performance and economic growth, the paper will examine a positive correlation between FDI inward stocks and number of patent applications in V4 region in total (hypothesis A). Considering studies of OECD indicating that the globalisation processes lead to internationalisation also in area of R&D and innovations, the article will focus on testing a positive correlation between FDI inward stocks originated from the 15 most innovative countries (TOP15) and number of patent applications in V4 region (hypothesis B). The list of most competitive countries is based on GII 2012 and contains: Switzerland; Sweden; Singapore, Finland, United Kingdom, Netherlands, Denmark, Hong Kong (China), Ireland, United States, Luxembourg, Canada, New Zealand, Norway; Germany. FDI inward stocks are in millions EUR as a total sum coming to V4 region from all over the world or from TOP15. The number of patents is measured by patent applications to the EPO by priority year at the national level as a total sum in V4 region. The correlation of indicators will be tested using linear regression and correlation analysis methods.

3. Analysis of FDI inward stocks and patent applications

In general, the amount of total FDI inward stocks increased by 462 % in V4 region in 2000 – 2010 with higher dynamics during 2004 – 2007 connected with joining the EU, when 55 % of absolute change during the period and the highest annual relative change (24.3 % in 2004) occurred. The country with the highest relative change was Slovakia, where FDI inward stocks increased by 675.3 % (2000 – 2010) and Poland had the biggest share on total FDI inward stocks within observed period (41.2 %) with a slight increase during the recent years. The dynamics of FDI inward stocks originated from TOP15 is similar, but slightly slower (+413.5 %; 2000 – 2010) with the highest rates again during the accession period (2004 – 2007)[2], when 58.5 %[3] of absolute change within 2000 – 2010 happened. The share of Poland on total FDI inward stocks from TOP15 is 40.7 %. The TOP15 represent 60 % of all FDI inward stock in 2000 – 2010, with the highest percentage (but decreasing trend) in the Czech Republic (70.9 %).

What regards patents, the dynamics of the whole V4 region was in comparison to FDI inward stocks slower, the number of patent applications rose by 235 % (2000 – 2010), with the highest growth in Poland (+610 %) and the lowest in Hungary (+67 %). Slovakia had the lowest[4] percentage (6 %), the remaining share of 94 % was almost

[1] E.g. for FDI stocks from Luxembourg coming to the Czech Republic in year 2000.

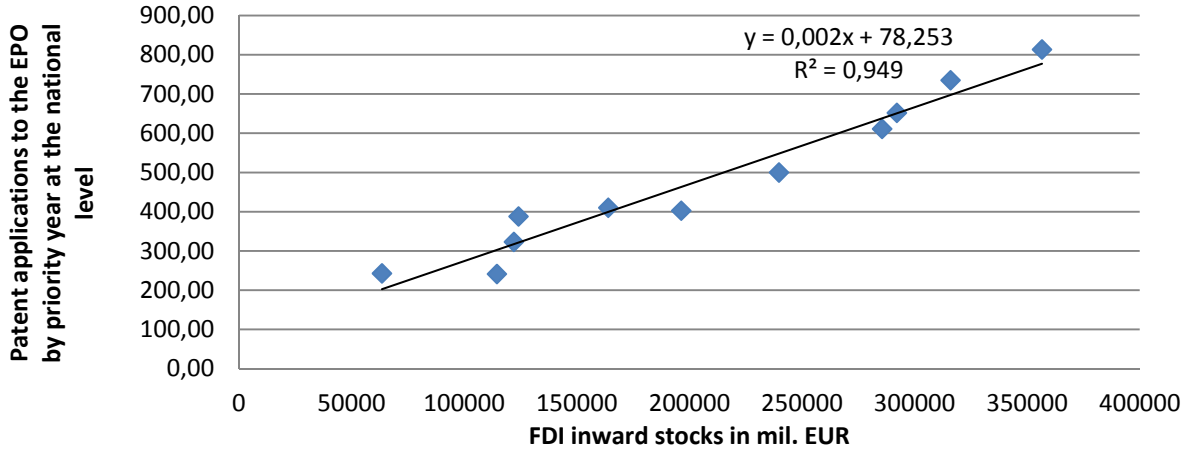
[2] But e.g. in Slovakia + 31. 8 %; 2003; y/y.

[3] The number is influenced by missing data for years 2000-2002 for Hungary.

[4] In case of measuring patent applications per million inhabitants, Poland with the highest share of 31,9 % would drop to the last place with 10,4 % behind Slovakia with 13,5 %.

equally divided among the others. In this case, the activity is shifted to the last 4 years (2007 – 2010], when 55 % of overall absolute change in number of patent applications for the whole period of 2000 – 2010 occurred. The highest relative annual growth rates were in 2002 (+35 %) and in 2006 (+24 %).

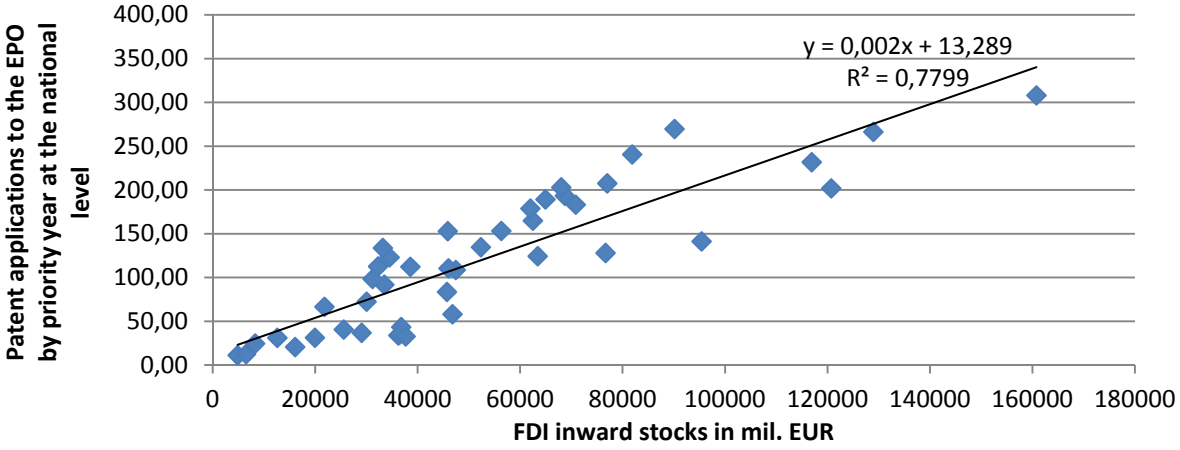
Fig. 1 Patent applications and total FDI inward stocks in V4 (aggregate; 2000 – 2010)



Source: own calculations and processing based on [11]

Applying the correlation and regression analysis on total FDI inward stocks and number of patent applications in V4 confirmed the hypothesis A that there is a positive correlation between these two indicators when measured as aggregate for the whole V4 region (Fig. 1) with correlation coefficient (R) of 0.97416 and coefficient of determination (R^2) of 0.949. For comparison reasons, the Fig. 2 shows the difference in correlation when measured using all individual values for each country.

Fig. 2 Patent applications and total FDI inward stocks in V4 (individual values; 2000 – 2010)



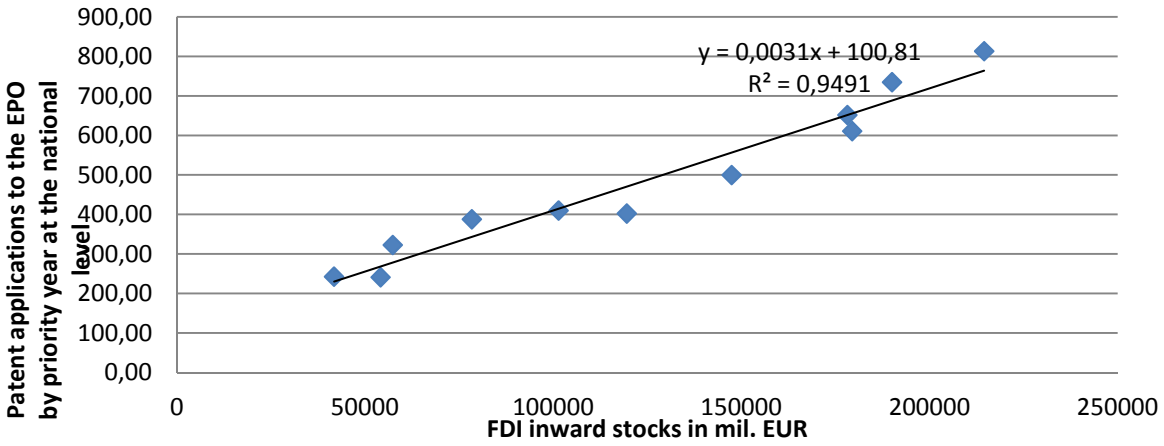
Source: own calculations and processing based on [11]

Although, it is still high: R = 0.8831 and R^2 = 0.77991, it is noticeable lower. A closer look at each country separately would show that the Czech Republic proved the strongest correlation (R = 0.9788 and R^2 = 0.9581), on the contrary Slovakia albeit had a positive

correlation as well, it was significantly lower: R = 0.77844 and R^2 = 0.60597. The average of values for V4 countries were R = 0.91352 and R^2 = 0.84097.

Further analysis of FDI inward stocks originated from the 15 most innovative economies pointed at the fact that there exists even stronger correlation: R = 0.97424 and R^2 = 0.94914 (when measured as aggregate) or R = 0.9191 and R^2 = 0.84474 (when measured using individual values for each V4 country), while the average of values of each V4 country were R = 0.91966 and R^2 = 0.8496. Although, Slovakia again registered lower values, the correlation was stronger.

Fig. 3 Patent applications and TOP15 FDI inward stocks in V4 (individual values; 2000 – 2010)



Source: own calculations and processing based on [11]

Conclusions

Foreign direct investment played a central role during the transformation period in 1990's, participated in privatisation, allowed fast and relatively successful transition to market-based economy, contributed to dramatic structural changes laying foundations of rapid economic growth, which is necessary for catching up leading European economies, and they significantly helped in preparing domestic economies for extensive and intensive European competition within the internal market after the entry of Visegrad countries to EU in 2004.

V4 countries still have space for improvements. As GCR shows, the Czech Republic and Slovakia are in the group of 35 innovation-driven economies, while Poland and Hungary are in the group of 21 economies in the transition to that group from efficiency-driven stage. According to the GII, Poland and Slovakia (ranking 44 and 40) are behind the Hungary (31) and the Czech Republic (27), in respect to Innovation Output Index Poland lags behind even more (50).

Thus, nowadays, a shift to a growth model based on knowledge creation is inevitable for Visegrad countries, due to possible diminishing effect of previous FDI waves profiting from low labour costs advantages and due to increased competition pressure resulting

from stagnation or slow growth in EU. Companies, regions and state face very urgent question – how to increase competitiveness? The answer in many cases involves improving business environment and stimulation of innovation activity.

The paper confirmed that in case of Visegrad countries there is a strong correlation between total FDI inward stocks and number of patent applications to the EPO (by priority year at the national level) when measured as aggregate for the whole V4 region. The positive correlation showed up also when all individual values for each country were used, although Slovakia registered a bit weaker relation. A closer look at FDI stocks from 15 most innovative countries in relation to patent applications revealed even stronger correlation.

The extent of the article does not provide enough room for detailed analyses or a broader geographical context (e.g. comparison within EU12). Further possible options for analysis lie also in modifications of indicators, e.g. using PCT patent applications, relate applications to inhabitants, labour force; to Business enterprise sector's R&D expenditure (BERD) or total R&D expenditure (GERD); including trademark registrations or take into consideration other aspects of R&D and innovation activities. A structural approach – analysis of target activities for FDI and R&D and innovation outcomes (based on NACE) may bring interesting results as well.

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The Analysis of Investment in Higher Education Influenced by Macroeconomic Factors

Abstract

Political, economic and social reforms that started in Lithuania in the beginning of 1990 influenced essential changes in all spheres of social lives, as well as business and the field of paid work: the decline of manufacturing inevitably influenced the number of employed people and the growth of unemployment. Structural changes in society's employment were the outcome of privatization and economic modernization processes. New employment groups according to the economic status such as employers, self-employed and employees emerged. The demand of skilled employees increased. Because of the changes in the labor market, the requirements for skills and competences were altered, which encouraged individuals to make a decision to invest in education. The purpose of the paper is to identify the macroeconomic indicators affecting the investment in higher education and to determine their interdependence with the indicators of educational system. In order to determine relation between the indicators of labor market and educational system it is necessary to estimate the strength of correlation between them. Analysis of macroeconomic indicators and educational system showed that the research of investments in higher education is an important issue. Analysis of statistical data leads to the conclusion that salary and opportunity to find a job directly depends on education. Lots of people want to acquire higher education and this fact is changing the structure of the labor market. The number of people with higher education will increase rapidly, but the number of jobs with such high qualification will not increase enough. Therefore potential students will be motivated on economic basis, but not psychological incentives or prestige. Examining the effectiveness of investment in education it is necessary to do the investigation, which could be used to predict what expectations individuals have from investments in higher education. It is important to examine the relation between education and increase in salary and their dependency. The research is relevant in Universities analyzing the market, their attitude and the possibility of providing financial resources for education.

Key Words

higher education, investments, macroeconomic, indicators

JEL classification: J21, J24, E24, E60

Introduction

In this paper the term "higher education" refers to ISCED 97 Level 5: Tertiary education (first stage) [7]. Environmental impacts have affected the investments in higher education [2]; therefore it is necessary to analyze the environment in which the decisions are made. Various processes affect the population. Lithuanian and foreign

researchers analyzed the relation between investment in higher education and economic growth: [11], [4]; [6]; [8]; [1], [5], [12] and others. It was noted that none foreign or Lithuanian researcher provided the coherent model for the evaluation of the labor market and educational system, which could help to establish the benefits of investments in higher education for the individual and the state.

Salary may depend on the chosen specialty. Properly chosen specialty ensures higher income in the future. Thus the choice should be determined not only by psychological factors. It is necessary to analyze macro-economic situation in the country before making the decision to invest or not.

The decision to study or not can be influenced by parents, the media, friends, relatives. Investment rate of return depends on the investor's age, marital status and gender. Women tend to choose the fields of study that lead to the future work in lower-salary sectors of the state economy more frequently. Therefore the decision to invest in higher education or not is influenced by the requirements in labor market, the structure of the educational system, the financial capacity of an individual, his/her desires and abilities.

1. Macro-economic factors influencing investment in higher education

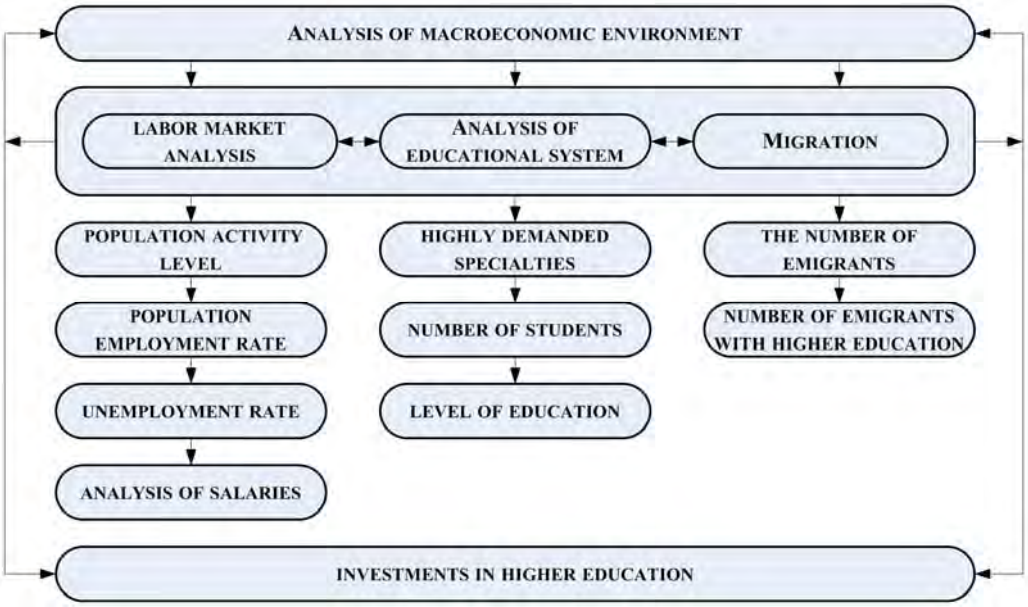
Investment in higher education is directly related to the labor market [10]: the analysis of demand and supply in labor market. It is very important to carry out the analysis of country's macro-economic situation, to examine the labor market, determine highly demanded specialties and only then to make the investment.

The labor market can be defined as a place or a procedure where the employer interacts with the job seeker in order to agree on the working conditions, time, salary, social benefits and guarantees, etc. The labor market, a constituent of the market economy [3], [12], in addition to its main function – the allocation of labor among economic activities, occupations, territories, enterprises – performs two socio-economic functions: distributes income in a form of salary and hereby encourages work activities, formally sets equal possibilities to everyone to exercise the right to employment and professional development.

It is necessary to take into account all the main factors and their indicators, while analyzing the labor market. Figure 1 shows the assessment model of macro-economic factors and investment in higher education. Before making the decision to invest in higher education or not, every individual has to assess whether the investment will be effective. Completed tertiary education is not always helpful and efficient. Higher education is not effective if:

- Acquired specialty is inappropriate, not demanded in labor market;
- An individual with a degree has an unqualified job (brain waste);
- An individual is unable to adapt to the labor market with his/her skills.

Fig. 1 Assessment model of macroeconomic factors influencing the investments in higher education



Source: own

In order to determine the relation between labor market and educational indicators it is necessary to establish the strength of this relation. Thus, the correlation analysis is performed.

The purpose of this paper is to identify the effect of macro-economic factors on investment in higher education. To reach this objective, the analysis of strength of relation between the labor market and education indicators was carried out. Since the variables were measured on the interval scale, a statistical monotonic relation was characterized by Spearman rank correlation coefficient. Spearman's rank correlation coefficient is non-parametric measure of statistical dependence between two variables. The main advantage of non-parametric measures over parametric ones is the absence of assumptions about the distribution of the observations. Spearman rank correlation is appropriate for both continuous and discrete variables, including ordinal ones. For very small samples the results of Spearman correlation should be interpreted with caution, because small sample size can result in a very strong correlation that is not statistically significant. The strength of relation was calculated for the following variables:

- State and local government expenditures on higher education;
- State and local government expenditure on higher education compared to GDP;
- Unemployed persons with higher or college education;
- Employed persons with higher or college education;
- Total number of unemployed;
- Total number of employed;
- Specialists with higher and college education;
- Number of emigrants with higher education compared to the total number of emigrants (who did not declare their departure);
- Emigrants with higher or college education;

- State budget allocations for higher education per student;

Relation analysis of labor market and educational system indicators aims to confirm or deny the dependency of investments in higher education on selected indicators.

2. Macro-economic factors affecting the investment in higher education: the case of Lithuania

The political, economic and social reforms, which began in Lithuania in in the beginning of 1990, led to significant changes in all spheres of public life, as well as business and the field of paid work: production decline inevitably had an effect on the decrease in the number of employees and the growth of unemployment. Structural changes in society's employment were the outcome of privatization and economic modernization processes. New employment groups according to the economic status such as employers, self-employed and employees emerged. The demand for skilled professionals began to increase. Due to the changes in the labor market, the requirements for skills and competences were altered, which encouraged individuals to make a decision to invest in education.

The different groups of population involved in this process are affected by various factors. Salaries may vary depending on the chosen specialty, thus properly chosen specialty will ensure higher incomes in the future. Women more frequently choose the fields of study that lead to the career in lower-salary sectors of the state economy. Lower salary can be related to another very important reason – family responsibilities. Women, going on maternity leave, lose their skills.

Tab. 1 The distribution of students

	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
College	**40472**	**52185**	**55949**	**56297**	**60096**	**61383**	**56704**	**53297**	**49777**
Men	15417	20787	22686	22705	24595	25913	24070	23363	22319
Women	25055	31398	33263	33592	35501	35470	32634	29934	27458
University: I stage studies	**105204**	**111082**	**113831**	**113745**	**112624**	**114528**	**112280**	**102887**	**95493**
Men	43204	44680	46057	46000	45981	47434	46440	42523	39941
Women	62000	66402	67774	67745	66643	67094	65840	60364	55552
University: II stage studies	**21520**	**23751**	**24148**	**25593**	**27795**	**30379**	**27431**	**25897**	**24578**
Men	8542	9146	9043	9515	9946	10909	9474	9063	8648
Women	12978	14605	15105	16078	17849	19470	17957	16834	15930
Total number of students	**167196**	**187018**	**193928**	**195635**	**200515**	**206290**	**196415**	**182081**	**169848**

Source: [9]

Therefore when making a decision to invest in higher education it is important to analyze the situation in country's economy and labor market. The decision to study or not can be influenced by parents, the media, friends, relatives. Investment rate of return depends on the investor's age, marital status and gender. Decision is influenced by the requirements in labors market, too. The demand for skilled professionals is increasing in

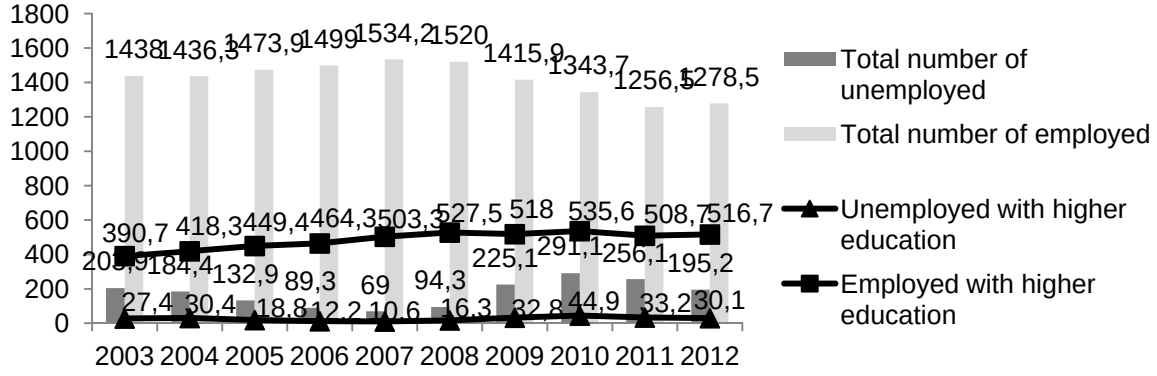
Lithuania; also the number of students is growing. Lithuanian labor market is specific, different from many European countries, since most of the women have work experience and women make up a larger share of students compared to men. The distribution of students is presented in Table 1.

As the results in Table 1 show the total number of students has increased till 2009 – 2010, and then started to decline. More and more individuals are choosing university education over college. The number of highly educated shows the development level of country‘s higher educational system, the need of higher education and the motivation of students. Women are more likely to acquire higher education compared to men. In all time periods the number of women is higher than men (in 2010 – 2011 women students accounted for 59 percent of total number of students, men – 41 percent). In 2010 – 2011 the number of women students was 1.43 times higher than men. The individuals, acquiring higher education, expect that it will make it easier to compete in the labor market, provide an opportunity to receive higher salary. Women enter the labor market having better education than men, but it does not have a significant impact on the achievements of employed women‘s and men's in the working sphere.

The analysis of literature revealed that the main factors allowing competing in the labor market are education, professional qualification, additional professional skills (good knowledge of foreign languages, computer literacy, entrepreneurial skills, communication skills, and willingness to work).

Assessment of these factors suggests that an individual's competitiveness in the labor market and the probability of getting a job depends directly on the level of education. As shown in Figure 2, the smallest part in the total number of unemployed are individuals with higher and college education (in 2012 individuals with higher and college education accounted for only 15.4 percent of total number of unemployed).

Fig. 2 Unemployed and employed, by education, compared with total number of the unemployed and employed, thousands of individuals.



Source: [9]

After analyzing the data of 2003 – 2012, it can be concluded that university and high school graduates (this term here refers to ISCED 97 Level 4 Post-secondary non-tertiary education [7]) have no trouble in finding a job (in 2012 40.4 per cent of all employed were individuals with higher and college education).

Employees with higher education have greater demand in the labor market. Therefore, the young and older people acquire the necessary education even if they have to pay a large part of the funds necessary to get an education by themselves. Expenditure on education in state and local government budgets amounted to 6271 million LTL in 2012, or 5.9 percent of country's GDP. During the study period, funds for higher education and funding for research and development in the field of education were the highest in 2008. The decline in 2010, 2011 was due to the economic crisis and the decline in the number of students.

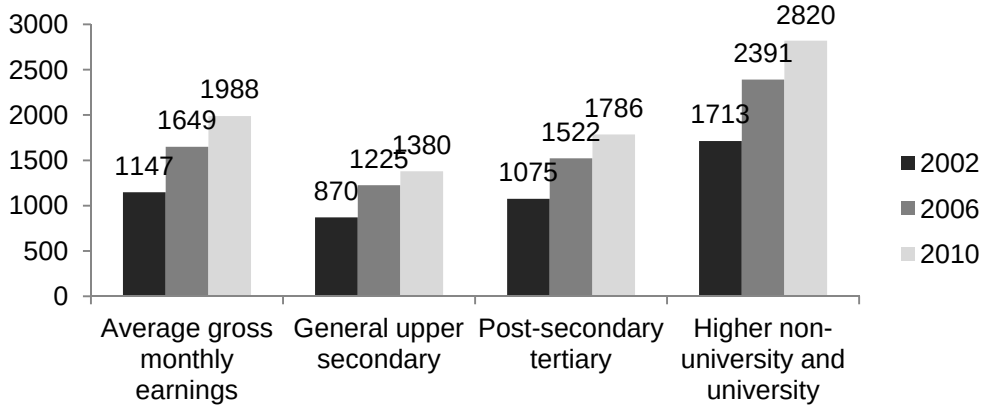
Tab. 2 Expenditure on education in state and local government budgets

	2005	2006	2007	2008	2009	2010	2011
Total funds allocated for education, million LTL	3919	4470	5129	6278	6221.7	5912.9	6271
Funds for education compared to GDP, %.	5.4	5.4	5.2	5.6	6.8	6.2	5.9
Funds for higher education, million LTL	898.6	965.7	1058	1259	1189.5	1158.3	1063.6
Funds for research and development in education, million LTL	4.8	4.9	5.2	259.6	223.3	140.2	150.9

Source: [9]

The increasing demand for higher education shows the growth of educational prestige. One of the main reasons for this phenomenon is competition in the labor market and the dependence of availability of jobs on the level of education. The fact that salary depends on education was approved by the Lithuanian Department of Statistics. The Department of Statistics carries out the investigation on the structure of earnings by occupation, education and gender every four years. Survey information is collected at the individual level (employees) from the local units and enterprises, institutions and organizations. Recent data provided by the Statistics of Lithuania is for the year 2010. The average salary was 1988 LTL. The salaries of employees from different occupational groups but having the same level of education were unequal.

Fig. 3 The structure of average monthly salary by education 2002 – 2010 in Lithuania, LTL



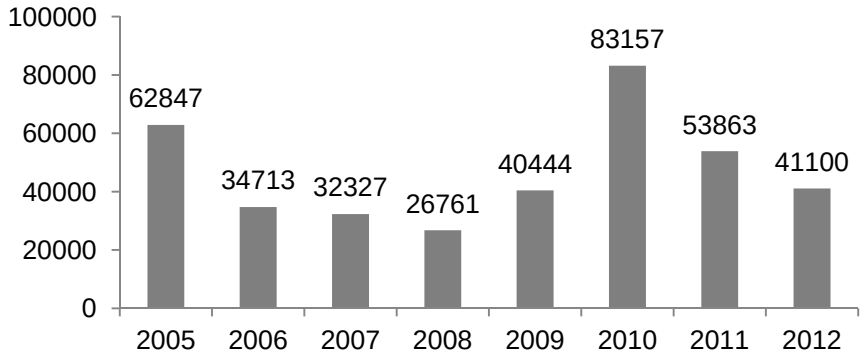
Source: [9]

As shown in Figure 2, salaries tended to increase in all cases. Maximum salary is paid for individuals with tertiary education.

According to the census data of the Statistics Lithuania on May 16, 2011 there were 3 million 53.8 thousand people in Lithuania. 10 years ago the country's population was 3.48 million., 1989 – 3.67 million. In the beginning of 1990s Lithuania, as the independent country, had a population of 3.7 million. Comparing these figures, it can be stated that over two decades Lithuania lost about a quarter of its population – 700 thousand people. Most of the population was lost due to increased emigration. The increase of emigration from the country means that not just lower education and low-skilled individuals are leaving the country, but also the specialists with higher education. Since 2005, the number of highly qualified emigrants and emigrants with university or college education has been annually increasing Lithuania. In 2007 a quarter (25.8 percent) of all individuals who have emigrated from Lithuania had higher or college education. During the economic downturn the increased number of skilled unemployed individuals compared with the overall number of emigrants in 2011 – 2012 reached 35 – 40 percent. Such tendencies are reinforced by rising unemployment and an increasing number of people, experiencing difficulties in repaying housing loans and consumer credits. The loss of skilled labor force will become more and more difficult to compensate with the new generation of qualified professionals, as it is likely that the high price of higher education will reduce possibilities of large part of young people to acquire higher education. This tendency will be reinforced with the fact that a part of young people, able to pay for their education, will leave to study at foreign universities, and then get the job there. In this case, retrieving the emigrants, even with improvement in the economic situation in the country, will be very difficult.

It is difficult to accurately assess the number of emigrants in Lithuania because not all individuals who emigrated declared their departure. The structure according to the declared place of residence is shown in Figure 4.

Fig. 4 The number of emigrants (based on the declared place of residence), individuals



Source: [9]

The number of emigrants in 2010 rose 3.78 times compared to 2009, but in 2011 and 2012 the scale of emigration started to decline. Countries with high emigration numbers can face labor shortage. Emigration is driven by various reasons, but one of the main incentives – economic motive (a desire for higher standard of living). In order to reduce the emigration, it is necessary to ensure the opportunity to have higher incomes to the

residents of Lithuania, hereby removing the reason for emigration that government can affect.

The strength of relation between indicators of labor market and the educational system in terms of strength of connection. As the study variables are interval and relatively short period is analyzed, the relation strength is measured using Spearman‘s coefficient. The results of correlation analysis are presented in Table 3.

Tab. 3 The labor market and the educational system interdependence (correlation)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.				0.968**			0.948**			
2.			0.928**		0.954**					-0.982**
3.		0.928**			0.995**			0.920**		-0.979**
4.	0.968**						0.943**		0.972**	
5.		0.954**	0.995**					0.894*		-0.989**
6.							0.895*			
7.	0.948**			0.943**		0.895*			0.955**	
8.			0.920**		0.894*					-0.838*
9.	1.000**			0.972**			0.955**			
10.		-0.982**	-0.979**		-0.989**			-0.838*		

Note: 1. State and local government expenditure on education: higher education; 2. State and local government expenditure on education compared to GDP (higher education); 3. Number of unemployed with higher or college education; 4. Number of employed with higher or college education; 5. Total number of unemployed; 6. Specialists (with higher education); 7. Number of emigrants with higher education compared to total number of emigrants, who did not declare their departure; 8. Emigrants with higher education, who did not declare their departure; 9. State budget allocations for higher education per student; 10. Total number of employed

Source:authors' own calculations

Relations are statistically significant ($p < 0.05$) (** marked values indicate that $p < 0.01$, * marked values indicate that $p < 0.05$). The performed correlation analysis revealed that the selected indicators of the labor market and the education system have a monotonic relation, characterized by Spearman rank correlation coefficient. State and local government expenditure on higher education have a statistically significant correlation with the number of employed with higher education (0.968) and with the number of emigrants with higher education (0.948). The more funds government allocates to higher education, the more individuals are seeking to acquire it. State and local government expenditure on education compared to GDP is correlated with the number of unemployed with higher education (0.928), the total number of unemployed (0.954) and there is a strong statistically significant inverse relation with the total number of employed (-0.982). The dependence between increasing expenditure on education compared to GDP and graduate unemployment means that: 1) the state allocates the funds on not demanded specialties and 2) the market is already saturated with skilled specialists. Number of specialists with higher education has a strong statistically significant correlation with the number of emigrants with higher education (0.895). The number of emigrants with higher education is correlated with the number of unemployed with higher education (0.920) and the total number of unemployed (0.894). This suggests that emigration is directly dependent on the situation in the labor market;

if an individual who has tertiary education, cannot find a job in accordance to his/her qualification in Lithuania, he/she will search for a job abroad.

Conclusions

Performed analysis of the labor market and the educational system revealed that the research of investment in higher education is an important issue. Statistical analysis of the data suggests that the salary, opportunities in the labor market directly depends on education. The determination of a large part of population to study is going to rapidly change the structure of the labor market – the number of people with higher education has grown substantially, but the number of jobs which would require a high level of qualification will not increase so rapidly. Thus, potential students will base their decision to study on economical basis rather than psychological, such as prestige, self-realization, and incentives.

Examining the effectiveness of investment in education, it is relevant to perform researches, which can be used today to predict the individuals' expectations for investments in education. It is important to examine whether education and salary increase are related, and dependent on each other. This kind of research is relevant in the University, analyzing the market, students' attitude to education, mood, and the availability of certain financial resources for education.

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Econometric Analysis of Macroeconomic Efficiency Development in the EU15 and EU12 Countries

Abstract

The paper evaluates the macroeconomic efficiency development in the countries of the European Union by the Data Development Analysis (DEA). The aim of the paper is to measure and assess the efficiency potential of the "old" (EU15) and "new" EU countries (EU12) in 2000-2011. The DEA method is convenient because it is based on the ratio between input- and output-indicators thus measuring the efficiency with which the EU countries transform their inputs into outputs. DEA conveniently analyses effective/ineffective positions of each country providing numerical values describing the efficiency of economic processes in these countries. Efficiency can be thus considered as a "source" of competitiveness. When applying the DEA method, the indicators of the Country Competitiveness Index (CCI) are used. The following econometric development analysis of the macroeconomic efficiency is undertaken with the help of the dynamic panel model with fixed effects estimated by the pooled least squares method.

Key Words

CCI approach, DEA method, dynamic panel data models, EU12, EU15, macroeconomic efficiency

JEL Classification: C14, H11, H50

Introduction

The European economies focus on long-term enhancement of their competitiveness, sustainable economic growth and increased level of performance. Reaching higher levels of competitiveness is significantly hindered by the heterogeneity of the EU member states. There are significant disparities between the EU countries and especially between their regions which have a negative impact on the balanced and sustainable development weakening the EU's performance and competitiveness globally. The EU enlargement process has brought the "old" (EU15) and "new" EU (EU12) member states new opportunities as well as threats within the European and world economy. The long-term performance growth, high level of employment and high standard of living in all EU member states are impossible without increased competitiveness, high stability of macroeconomic environment and efficiency of the whole economy. Performance is therefore one of the basic standards of efficiency evaluation and it is also reflects the relative success of the area; see e.g. [5], [6].

The definition of competitiveness is a complex issue as there is no mainstream understanding of the term. Competitiveness has been a concept that is not well

understood or that can be understood in different ways and on different levels despite its widespread acceptance and its undoubted importance. In the European Competitiveness Report the European Commission suggests that the economy is competitive if its population enjoy a high and constantly rising living standards and permanently high employment [6]. Competitiveness is complemented by performance and efficiency, all of them determining the long-term development in the countries within the globalized economy. Measurement, analysis and evaluation of the changes in productivity, efficiency and the level of competitiveness are controversial topics arousing a considerable interest of researchers; see e.g. [4]. In the EU, the concept of competitiveness is a specific issue considering the inclusion of the European integration elements that go beyond purely economic parameters. An economy may be competitive and efficient but if it negatively impacts both society and environment the concerned country will face major difficulties, and vice versa. Therefore in the long run the governments cannot focus on the economic competitiveness only but they should focus on social and environmental factors as well; to govern they need an integrated approach and a focus on the broadest aspects impacting competitiveness, subsequent performance as well as efficiency [2].

Systematic understanding of the factors affecting productivity and subsequently competitiveness is highly important. Effectiveness – and especially efficiency – are the main sources of macroeconomic competitiveness [6]. An efficiency and effectiveness analysis is based on the relationship between the inputs (entries), the outputs (results) and the outcomes (effects). In general terms, efficiency can be achieved when there are maximum results relative to the resources used, it is calculated by comparing the effects obtained in the process. Efficiency results from the relationship between effects or outputs and efforts or inputs. The effectiveness indicator is given by the ratio of the results obtained to those which were planned to be achieved. Effectiveness implies a relationship between outputs and outcomes. In this sense the distinction between output and outcome must be made. The effects resulting from the implementation of outcomes are influenced by results (outputs) as well as by some other external factors.

The paper is divided into five sections. The introductory section is devoted to the factors and sources of macroeconomic efficiency. The first section describes the theoretical background of the DEA method as well as the method of econometric estimation of the dynamic panel model for the macroeconomic efficiency development. In the second section, empirical results are analysed and discussed; the levels and trends of macroeconomic efficiency development are compared for EU15 and EU12. The estimation of the panel model with fixed effects enables us to pursue the common and individual trends of macroeconomic efficiency. The results of the macroeconomic modelling are compared for both groups of the EU countries. The comprehensive results and further possibilities for research are summarized in the final section.

1. Data analysis

The efficiency analysis based on the DEA method is used to evaluate macroeconomic efficiency and its potential for further development. Based on the facts introduced

above, macroeconomic efficiency will be determined by the output of economy to the weighted sum of inputs. The database of indicators is based on the Country Competitiveness Index (CCI). The indicators of CCI are grouped together according to their dimensions (input versus output) of the described national competitiveness. The terms 'inputs' and 'outputs' classify the indicators, those describing the driving forces of competitiveness in terms of long-term potentiality and those which are direct or indirect outcomes of a competitive society and economy. The methodology of CCI is therefore a convenient tool with which the national competitiveness determined by the DEA method can be measured.

In this paper, the inputs include six groups of indicators describing institutions, macroeconomic stability, infrastructure, health, quality of education and technological readiness. The set of data file has 17 selected indicators – 16 of them are inputs and 1 is an output. Based on factor analysis, these indicators were chosen as the most important components of competitiveness factors. The source of the indicator data is the World Bank database.

The first group of inputs includes 4 institution indicators: voice and accountability, government effectiveness, regulatory quality and rule of law. These indicators are expressed as a percentage of the views of the citizens. The second group of input indicators for macroeconomic stability includes 3 items: income, saving and net lending/net borrowing, labour productivity per person employed and gross fixed capital formation. The third group of input indicators reflects infrastructure levels and it is represented by 4 indicators: railway transport – length of tracks, air transport of freight and air transport of passengers. The forth part is linked to health care inputs and includes 2 indicators: the ratio of the number of deaths of children under one year of age to the number of live births and cancer disease death rate. The fifth group of input indicators includes education quality, training and lifelong learning and it is represented by one indicator only: total public expenditures at secondary level of education. The sixth group of input indicators includes 2 indicators for technological readiness: accessibility of university education and e-government availability. The output of economy will be given by one indicator – GDP per inhabitant in Euro as a percentage of the EU average. The database consists of the annual values of indicators for EU27 in the reference period of 2000 – 2011.

2. Investigation methodology

In this section, the optimization procedure of the input-oriented CCR CRS model is summarized (the DEA analysis), it is expressed as a dynamic panel model examining the form of macroeconomic efficiency development estimated by the least squares method with fixed effects.

2.1 DEA analysis

An advanced DEA approach is used for calculate the macroeconomic efficiency in the selected countries. In this paper the input-oriented *Charnes-Cooper-Rhodes (CCR) model with Constant Returns to Scale (CRS*) is used. It evaluates the efficiency of production units – Decision Making Units (DMUs), resp. *DMUj (j = 1, 2 ... n)* during the time period *t = 1, 2,..., T*. Production technology S^t is known for each time period. Production technology S^t transforms inputs into outputs [8]. Suppose each DMU_j *(j=1, 2,..., n)* produces a vector of output $y_j^t = \left(y_{1j}^t, \ldots, y_{sj}^t\right)$ by using the vector of inputs $x_j^t = \left(x_{1j}^t, \ldots, x_{mj}^t\right)$ at each period *t, t=1... T*. From *t* to *t+1*, DMU_j's efficiency may change or/and the frontier may shift. $D_q^t\left(\boldsymbol{x}^t, \boldsymbol{y}^t\right)$ is a function that represents the production technology St and assigns to the evaluated production unit efficiency rate Uq. In input oriented model, if $D_q^t\left(\boldsymbol{x}^t, \boldsymbol{y}^t\right) < 1,$ than unit q is inefficient and if $D_q^t\left(\boldsymbol{x}^t, \boldsymbol{y}^t\right) = 1$, than unit q is efficient. Alpha Effective units then specify the production possibility frontier [7]. The calculation of $D_q^t\left(\boldsymbol{x}^t, \boldsymbol{y}^t\right)$ for production unit q, for m inputs and r outputs, present to minimize a linear programming equation (1) [3]: $\theta_0^t\left(x_0^t, y_0^t\right) = \min \theta_0$ subject to:

$$\sum_{j=1}^{n} \lambda_j x_j^t \le \theta_0 x_0^t \;\; i=1,2, \ldots, m \qquad \sum_{j=1}^{n} \lambda_j y_j^t \ge y_0^t \;\; i=1,2, \ldots, m, \tag{1}$$

where $\lambda_j \ge 0,\ j = 1, \ldots, n;\ x_0^t = \left(x_{10}^t, \ldots, x_{m0}^t\right)$ and $y_0^t = \left(y_{10}^t, \ldots, y_{s0}^t\right)$ are input and output vectors of DMU_0 among others.

2.2 The panel data econometric methods

Among the major advantages of the panel data is its ability to model the individual dynamics. The autoregressive panel data model [8] with a lagged dependent variable y_{it-1} (AR(1)) is considered, that is

$$y_{it} = \beta \cdot y_{it-1} + \alpha_i + u_{it}, \tag{2}$$

where it is assumed that u_{it} is $IID(0, \sigma_u^2)$. It is assumed that $|\beta| < 1$. Because y_{it-1} and α_i are positively correlated, the application of the ordinary least squares method (OLS) is inconsistent, overestimating the true autoregressive coefficient (in the typical case $\beta > 0$. To solve the inconsistency problem, it is necessary first of all to begin with a different transformation to eliminate the individual effect α_i, in particular there are taken firstly differences. This gives

$$y_{it} - y_{it-1} = \beta \cdot \left(y_{it-1} - y_{it-2}\right) + (u_{it} - u_{it-1}), \qquad t = 2, \ldots, T. \tag{3}$$

If estimation is based on OLS, it does not obtain a consistent estimator for β because y_{it-1} and u_{it-1} are correlated, even if $T \to \infty$. In many applications, this first-difference

estimator appears to be severely biased. However, this transformed specification suggests an instrumental variables approach. It can be received an instrumental variables estimator for β as:

$$\hat{\beta}_{IV} = \frac{\sum_{i=1}^{N}\sum_{t=2}^{T} y_{it-2}\left(y_{it} - y_{it-1}\right)}{\sum_{i=1}^{N}\sum_{t=2}^{T} y_{it-2}\left(y_{it-1} - y_{it-2}\right)}. \tag{4}$$

The estimator (4) was proposed by Anderson and Hsiao [1]. Consistency of estimator (4) is guaranteed by the assumption that u_{it} has no autocorrelation.

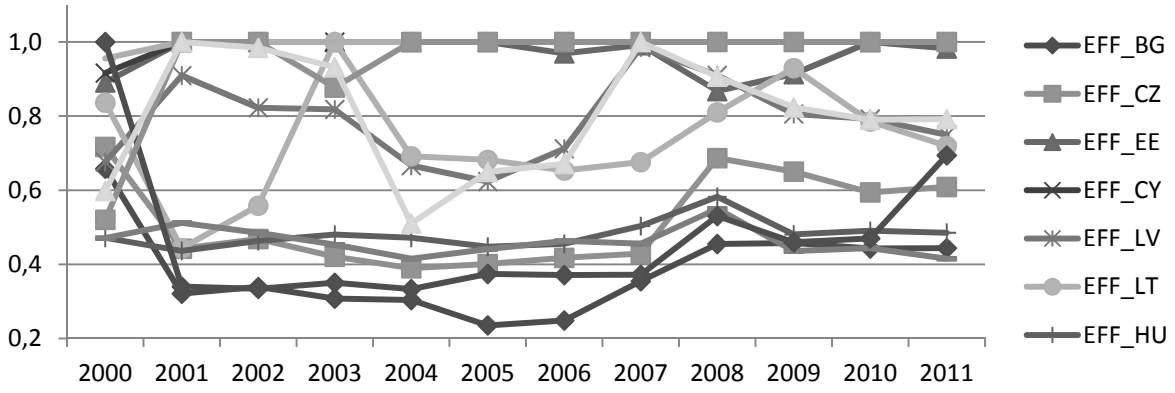
3. Empirical results

In this part of paper, the results of the DEA method are presented. This part also deals with the estimation of the proposed panel model of macroeconomic efficiency development with fixed effects for EU15 and EU12 countries in the reference period of 2000 – 2011.

3.1 Evaluation of macroeconomic efficiency with the DEA analysis

The CCR CRS model was calculated for all the EU27 countries for the two years in the reference period of 2000 – 2011. Fig. 1 presents the efficiency development for the group of the new EU member states. Descriptive statistics shows that average macroeconomic efficiency EFF_xx where xx presents the country code was at the level 0.711 with a standard deviation 0.253. It shows the countries as non-efficient as it is lower than 1. For the individual countries the average efficiency varied in the interval <0.253; 1>. It is a proof of significant individual differences or development changes within the given period. Table 1 shows that panel data efficiency for EU12 are stationary for the whole group I individually at significance level 1 %. According to the macroeconomic efficiency development in EU12 the economies may be divided into three blocks. The first one includes the countries with a very low, below average efficiency with values from 0.381 to 0.481, i.e. below 50 % level, Bulgaria – BG (mean EFF_BG 0.381, standard deviation 0.118), Czech Republic – CZ (0.455; 0.123), Poland – PL (0.462; 0.039), Romania – RO (0.469; 0.198) and Hungary – HU (0.481; 0.082). For the Czech Republic, there is a particularly significant positive break in 2007 corresponding to a higher standard deviation. On the other side the development of the Polish and Hungarian efficiency is linked to a low standard deviation. The second block of EU12 with an average macroeconomic efficiency above 0.7 includes Lithuania – LT (0.732; 0.153), Latvia – LV (0.789; 0.010) and Slovakia – SK (0.805; 0.167). The third block are the countries with a unit average macroeconomic efficiency and a low variability in time – Slovenia – SI (0.950; 0.140), Estonia – EE (0.968; 0.049), Cyprus – CY (0.993; 0.024) and Malta – MT (0.996; 0.013).

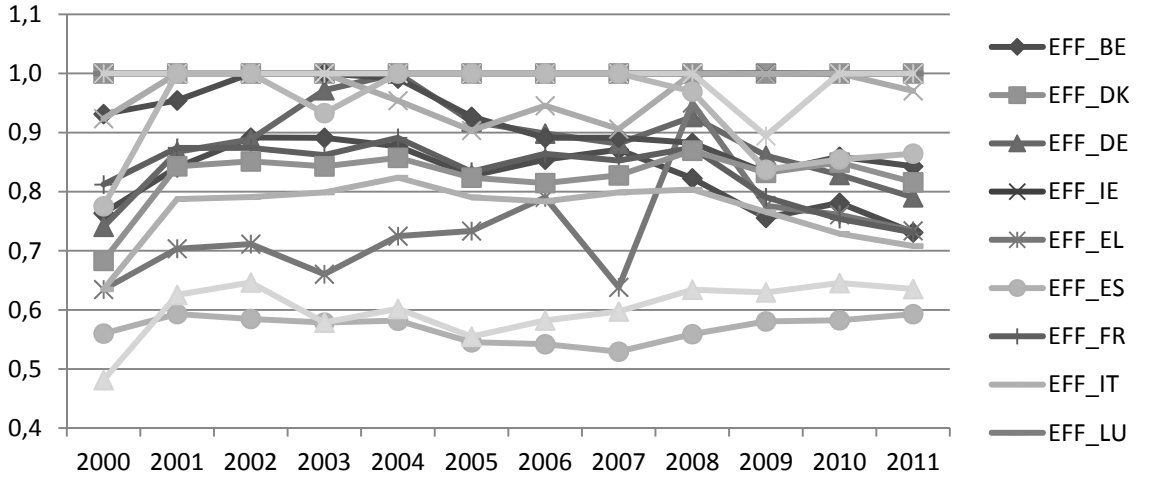
Fig. 1 Macroeconomic efficiency of EU12



Source: author's calculations

Fig. 2 illustrates the macroeconomic efficiency of the individual developed countries (EU15) during the reference period. Spain – ES has the average level with a relatively small oscillation (0.569; 0.021); Portugal – PT (0.601; 0.098) as well as Greece – EL (0.735; 0.084). It is a similar development to the one in the second block of EU12. There are seven countries of EU15 relatively close to the perfect efficiency: Italy – IT (0.768; 0.053), Austria – AT (0.826; 0.048), France – FR (0.834; 0.052), Belgium – BE (0.826; 0.056), Germany – DE (0.881; 0.056), Netherlands – NL (0.917; 0.060), United Kingdom – UK (0.936; 0.082) and Finland – FI (0.967; 0.039). The other EU15 economies have the perfect macroeconomic efficiency creating the efficient production frontier (Denmark – DK, Ireland – IE, Luxembourg – LU and Sweden – SE). When comparing Figures 1 and 2 and descriptive statistics for EU15 and EU12 it is possible to ascertain that the average macroeconomic efficiency in EU15 (0.857) is higher than in EU12 (0.711) and the variability (measured by standard deviation) is lower in EU15 (0.144). The macroeconomic efficiency in EU15 varied in the interval of <0.481; 1>. Fig. 2 also shows that testing of the unit root in EU15 panel data denies null hypothesis concerning common and individual existence of a unit root at 1% significance level. The same conclusion has been reached for EU12.

Fig. 2 Macroeconomic efficiency of EU15



Source: author's calculations

3.2 Modeling the macroeconomic efficiency

The first part content results of dynamic panel models estimation for macroeconomic efficiency developments; the results are summarized in Table 1.

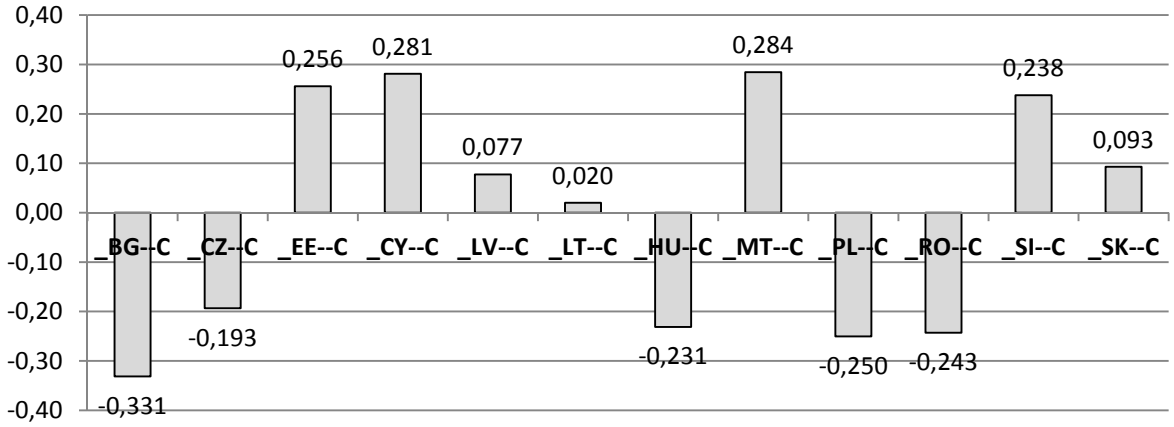
Tab.1 The estimation of the dynamic panel model for EFF-xx for EU12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.712019	0.009535	74.67166	0.0000
R-squared	0.811286			
Adjusted R-squared	0.795560	Mean dependent var		0.712019
S.E. of regression	0.114424	S.D. dependent var		0.253066
Sum squared resid	1.728253	Akaike info criterion		-1.418158
Log likelihood	114.1074	Schwarz criterion		-1.170674
F-statistic	51.58820	Hannan-Quinn criter.		-1.317595
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.479354

Source: author's calculations

The estimated autoregressive panel data model for the macroeconomic efficiency of EU12 are included in Tab. 1. The common lagged variable of macroeconomic efficiency EFF-xx was not statistically significant at 5% level of significance and it was therefore excluded from the applied model. The estimated model confirms that the stationary panel time series EFF_xx oscillate around the average level of 0.712*** and there are relatively stable in time at 1% significance level. The adjusted coefficient of determination is relatively high (0.796) and for time series residual components nonstationarity process at the 1% level of significance was found. But there was a strong and statistically significant pairwise correlation of residuals between the countries CZ-BG, SI-CY and MT and SI. Attention has been given to the estimation of the fixed effects displayed in Fig. 3.The positive fixed effects including the interval<0.238, 0.284> was recorded especially for the economies of Slovenia, Estonia, Cyprus and Malta.

Fig. 3 Estimated fixed effects of EU12



Source: author's calculations

Estimation of the dynamic panel model for the development of the macroeconomic efficiency for EU15 is shown in Tab.2. The average statistically significant macroeconomic efficiency is 0.863***, it is higher than in EU12 and there is also a statistically significant dependence on the level of lagged efficiency (0.272 ***) which

expresses the slight increase in time. Given the outcome of rejecting the null hypothesis of the presence of common and individual unit roots in the panel EFF_xx variables for EU15 this slight increase could represent a change in the individual behaviour within rather short time series. This corresponds to the panel unit roots testing of residual components. The explanatory power measured by the adjusted coefficient of determination was 0.908.

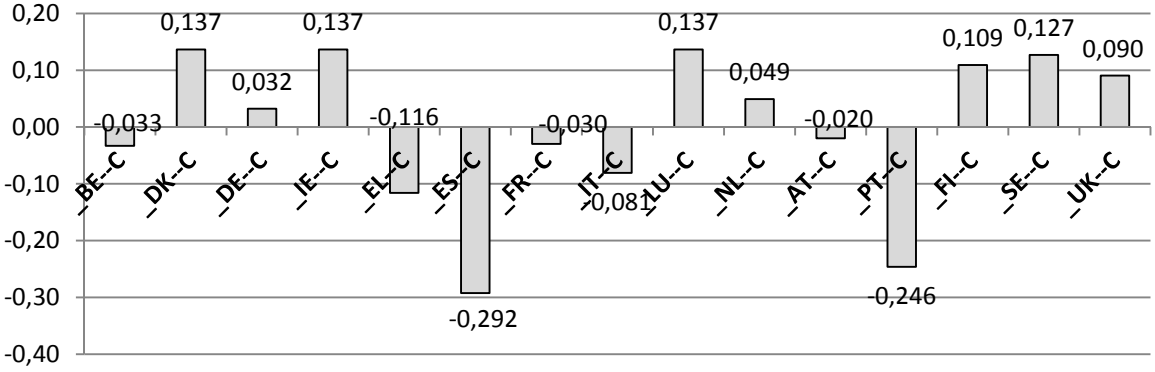
Tab. 2 The estimation of the dynamic panel model for EFF_xx for the EU15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.863352	0.004587	188.2064	0.0000
AR(1)	0.272332	0.069591	3.913316	0.0001
R-squared	0.916187			
Adjusted R-squared	0.907749	Mean dependent var		0.862272
S.E. of regression	0.042731	S.D. dependent var		0.140687
Sum squared resid	0.272060	Akaike info criterion		-3.375860
Log likelihood	294.5085	Schwarz criterion		-3.074677
F-statistic	108.5838	Hannan-Quinn criter.		-3.253600
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.693385

Source: author's calculations

Fig. 4 shows the estimated cross-section fixed effects and allows to classify EU15 with above-average macroeconomic efficiency in the interval of <0.090, 0.137>: United Kingdom (0.090), Finland (0.0109), Sweden (0.0127) and at the same level 0.137 there is Denmark, Luxembourg and Ireland. On the other hand, with below form efficient in the group of EU15 countries can be fixed through a negative effect identified Spain (-0.292) and Portugal (-0.246).

Fig. 4 Estimated fixed effects of the EU15



Source: author's calculations

Conclusions

The aim of the paper was to determine the macroeconomic efficiency with the DEA analysis for EU15 and EU12 and to compare its development in the reference period of 2000 – 2011. The estimation of the macroeconomic efficiency for the individual economies of EU27 has proved that the indicator of efficiency is overall and individually

stationary for both groups. The average level of the macroeconomic efficiency was lower in EU12 (0.711) and with a higher variability compared to the EU15 group (0.857).

The estimation of the dynamic panel model of the macroeconomic efficiency shows that the average efficiency in EU12 is lower (0.712***) than in EU15 (0.863***), but there is a stagnated development in EU12 during 2000 – 2011, however in the developed countries there is a slight increase of the delayed value (0.272***). The results of the estimation also identify the countries with the below average macroeconomic efficiency within EU12 (Bulgaria, Poland, Romania, Hungary and the Czech Republic) as well as in EU15 (Spain, Portugal). On the other hand, Slovenia, Estonia, Cyprus and Malta in EU12 and the United Kingdom, Finland, Sweden, Denmark, Luxembourg and Ireland in EU15 seem to be above average in macroeconomic efficiency. These positive deviations of the fixed effects in the group of the developed countries are lower than in the new EU member states. It is possible to investigate convergence processes of macroeconomic efficiency and deal with the identification and influence of deviation determinants from the efficiency of individual countries to the efficient frontier.

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The Characteristics of Product Platform Development Projects

Abstract

Project Management covers established techniques to execute projects successfully. In companies these techniques are adapted to specific needs. But even in R&D an equal treatment of all R&D project is neither effective nor efficient; in detail the challenges of R&D projects differ clearly in project-specific attributes like complexity, novelty of task, planning horizon, uncertainty, risk, dynamic of environment, time pressure, and capacity requirements.

In this paper we analyse the characteristics of product platform development projects to evaluate the necessity to handle these projects by defining a specific project type. We show differences between product platform development projects and product development projects in objects, expected effects, challenges, and decisions to be taken and also in risk management. Product platform projects are very much specific in the sense that it requires longer vision and future possible technology and market scenarios. Reducing development costs of product variants is one of the expected effects of platforms that firms strive to achieve. One specific challenge in product platform development projects is to find the right balance between product synergies and market diversity. Especially because of high complexity, the high number of interactive decisions, uncertainties in technologies and customer requirements, specific challenges in risk management companies in several industries might consider to establish an own project type for product platform development projects.

Key Words

project types, product platform projects, product management, risk management, innovation management

JEL classification: O32

Introduction

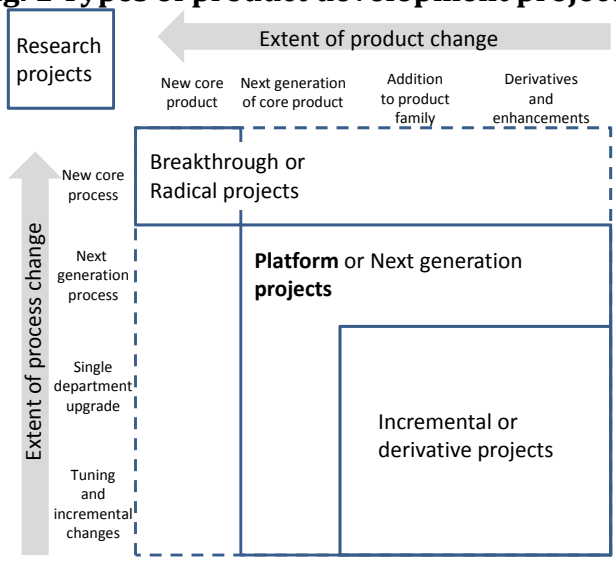
In most R&D Organizations projects are the dominant organizational structure to solve given targets. Projects are unique ventures with given targets, given restrictions regarding time, financial resources etc, and a specific organization [4]. Project Management, as an established discipline, covers techniques to execute projects successfully. In companies these techniques are adapted to their specific needs. But even in R&D an equal treatment of all R&D projects is neither effective nor efficient; in detail, the challenges of R&D projects differ clearly in project-specific attributes like complexity, novelty of task, planning horizon, uncertainty, risk, dynamic of environment, time pressure, capacity requirements [20]. On the other side it is obvious that there

shouldn't be too many project types, otherwise the recognition of project types is too low and the effort for implementation of project types is too high [20].

The target of this paper is to analyse the characteristics of development projects focussing on product platforms to evaluate the necessity to handle these projects by defining a specific project type. Product platform strategy is a well-established concept in industry to enhance cost reduction as well as to increase competitive advantages. They are implemented to bring product variety cost and time effectively to satisfy various customer needs. Several success stories of product platforms are found in different industry types: Volkswagen automotive platform [9], Sony Walkman platform [18], Black & Decker power tools platform [14], Hewlett Packard's Deskjet printer platform [15], and the Intel Microprocessor [3]. These stories provide clear evidences of product platform effects: a product platform can increase speed in product development, reduce product development costs, and contribute to an increase of product variety [1, 5, 16].

In literature a broad variety of definitions concerning the term product platform can be found: Meyer and Lehnerd [15] coin the term in a quite narrow way. They define a product platform as a set of subsystems and interfaces that form a common structure from which a stream of derivative products can be efficiently developed and produced. McGrath [13] considers a product platform to be a collection of common elements, especially the underlying core technology, implemented across a range of products. Robertson and Ulrich [17] propose a broader definition of the term. They understand product platforms as a collection of assets (i.e. components, processes, knowledge, people and relationships) that are shared by a set of products. This brings forward a strategic understanding of product platforms, a view that is shared by many authors [5, 11, 14, 19]. All definitions focus on the fact that sharing elements or parts can help achieving certain positive effects.

Fig. 1 Types of product development projects

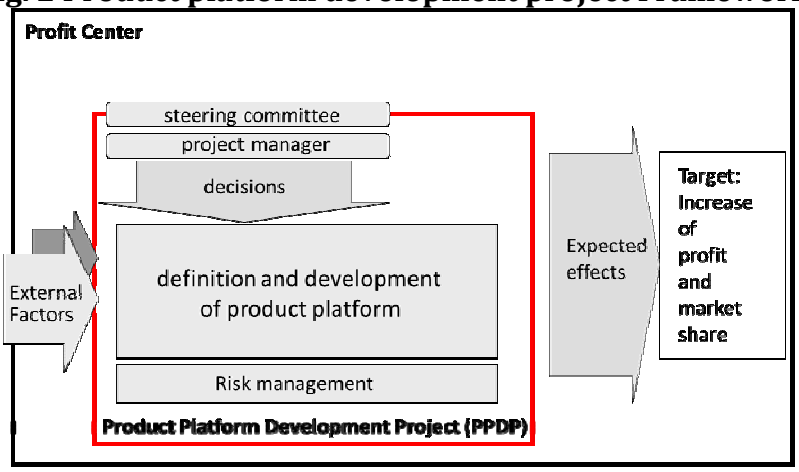


Source: [22, p. 93]

Product platform development projects (PPDP) are part of R&D project portfolio of a firm. Specht, Beckmann & Amelingmeyer [20] classify R&D-Projects in technology projects, predevelopment projects and product and process development projects. According to Wheelwright & Clark [22], product development projects can be incremental / derivative projects, platform projects or breakthrough projects depending on the extent of product and process changes (see fig. 1 above). Product platform development projects can represent new system solution for customers involving significant change in product dimension, process dimension or both [22].

By investing in product platform development projects firms expect effects to fulfil their strategic targets like increase of profit or market share (s. fig. 2). However, these expected effects are not achieved without proper planning and risk management. Project internal decisions play an important role maximizing the effects. On the other hand, company external factors like customer heterogeneity and price pressure may have a great impact on platform related decisions as well as the expected effects.

Fig. 2 Product platform development project Framework



Source: modification from [8]

As mentioned above the purpose of this paper is to evaluate the necessity to handle PPDP by defining a specific project type. In the following chapters we analyse the objects of PPDP, the expected effects of PPDP, the challenges and decisions within PPDP as well as the risk management in PPDP to find arguments for a special treatment defined by an own project type.

1. Product Platforms as objects of PPDP

From the previous discussion it is clear that product platform development is a specific form of product development where next generation products or processes, or both are developed. There is always a discussion among practitioners and academics how product platform development can be identified as a separate entity different from other product development activities. The following discussions will help to understand the difference.

Product platform projects are much more future-oriented than product development projects (PDP). Possible future products or variants or possible implementation in different derivative products from the platform are predicted beforehand. Cooper [2] characterized this nature platform projects as 'visionary' because they have a little concrete definition of tangible products, and at the same time, it is difficult to undertake detailed market analysis as well as full financial projections when only a first or a second product from the platform is even envisioned.

The product platform could be emerged from the existing products (bottom-up principle) or it could be developed by the organization itself (top down approach). However, in both cases different derivative products are developed to satisfy customer needs faster and cost effectively. Considering product/process life cycle, Tatikonda [21] argued that platform projects are more likely to occur early and, derivative product projects are more likely to occur later in the life cycle.

The target of a product platform project is "not to directly develop a new product, but to create the pieces or elements that enable the development of subsequent products" [13]. So, the outcomes of the platform projects are not products or processes like product development projects. The desire outcomes are common components or parts or process based on which new derivative product can be developed easily.

Product platform projects require more resources and involvement of senior management to complete it successfully. Planning and implementation of the project require more investment and times. As a result, a new product based on a new platform can take longer time than individual derivative products from existing platforms [13]. However, beauty of the platform development projects is that after successful implementation it helps to reduce development time for the derivative product significantly.

The next issue arises how long the developed platform can be used because we mentioned earlier that it requires often more investment and time than derivative products. If the platform is planned well considering possible future requirement of customers and market turbulences, a number of derivative products can be developed from this platform. So, the usage phase of a platform is often longer than the usage of single products [14]. Not only that the life of a platform can also be extended by the periodic improvement [13]. Successful implementations of platforms require regular monitor and updates as long as a next generation of the platform is not developed. Successful improvement will obviously increase platform's life span.

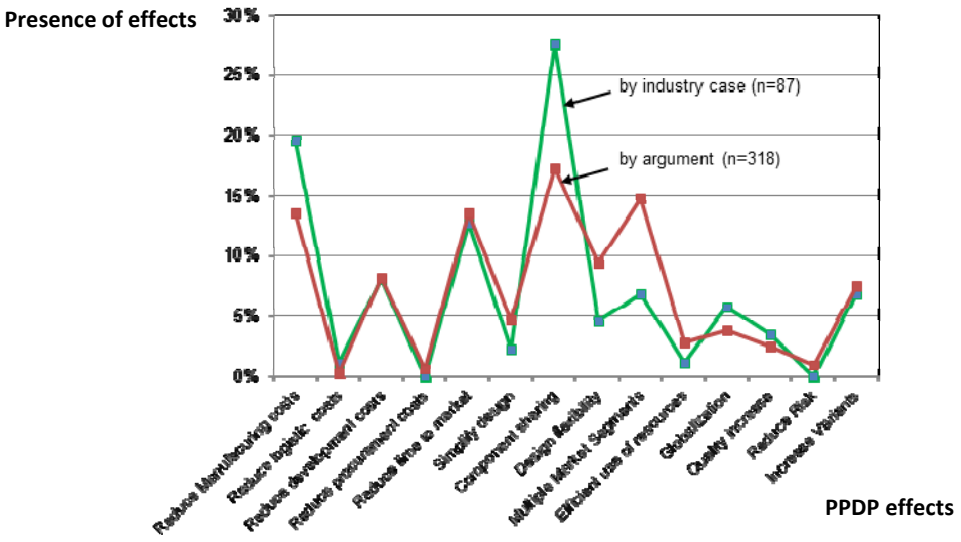
Derivative product development projects take the outcome from the platform projects and use the platform in their derivative products. So the direct internal customers for the platform are the derivative product development projects. The acceptance of the platform is bound with the internal customers who sense the voice of external customers. Considering the changes in products and processes, platform projects entail more product and process changes than derivative products [10, 20].

Summing up the above mentioned arguments there are several differences in the objects of PPDP and PDP.

2. Expected effects of PPDP

Successful planning and implementation of product platforms can bring certain positive effects. Among them, cost advantage in production, development, and in sales, marketing and service due to the platform are well known [1, 15, 17, 19]. But there might be also other relevant effects: Product platforms can help gaining competitive advantages by covering multiple market segments, covering global markets, reducing product time to market, reducing customer lead time, increasing quality and decreasing product investment costs [1, 15, 16, 17, 19]. The significance of these effects might be different by industry type. Also some of the potential effects, like reduction of logistic costs are not given much importance in the literature (s. fig. 3). The variety of expected effects differs from product development projects.

Fig. 3 Distribution of presence of effects in papers by industry case or by argument



Source: [6]

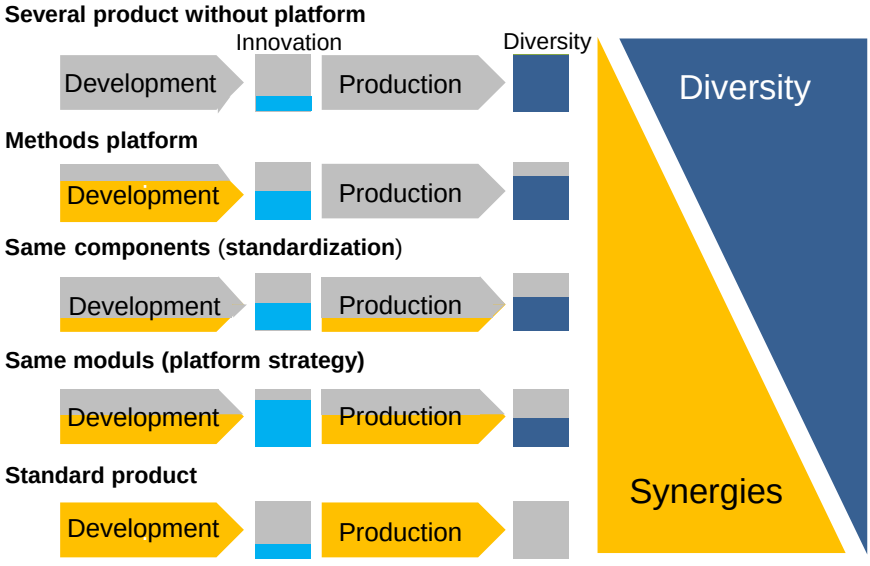
3. Challenges and decisions in PPDP

Companies usually face specific challenges during development and implementation of product platforms. Future products based on a product platform are much influenced by the turbulence or uncertainty in technology and the lack of knowledge about future customer requirements. In case of any new innovation or radical change in technology, the existing product platform has to be adjusted to fulfil customer requirement and keep pace with the technological changes. Also if future customer requirements are not predicted carefully or if customer requirements are volatile, there is a high possibility of product platform failure. To face these challenges, Harland and Yörür [8] proposed a flexible product platform development concept called “Platform Variant Funnel”, a

platform development process with rough and flexible variants concepts at the beginning, successive decisions during the PPDP, until finally a detailed concept including variant parameters and a market entry strategy emerges. This flexible platform development and integration of customers in different levels can help companies to adjust their platform attributes. Therefore the development targets differ from regular product development where project manager try to reduce risks by fixing development targets as soon as possible. Harland and Yörür [8] also proposed a PPDP specific decision framework covering market, synergy and customer integration related decisions. Some of these PPDP specific decisions are described in the following:

Companies try to reach synergy effects in different level of production and development which can bring cost advantages. Synergy effects can be reached between projects. The results of the previous projects can be taken from other projects (adoption), using previous modules in the next project (re-use of the modules) or sharing a set of modules of projects (platform). Among them platform oriented projects may show the best synergy. However, accomplishing too much synergy may also cost diversity in final products and may cause reduced market shares. So it is also a challenge for companies to balance the diversity and synergy targets. Figure 4 shows possible synergy and diversity impacts for different platform intensities. In case of methods platform, sharing common methods or concepts can bring synergy in development phase and in innovation, but almost no synergy gains in production level. By sharing modules can bring synergy in both development and production phases and still possess sufficient diversity which we considered as a more optimal way of platform design. Although standard products may be best for synergy effects but they lose the diversity of the final products.

Fig. 4 Challenges of platform development projects



Source: own developed

Companies often struggle to find a way to address multiple markets with limited resources. Product platform could be one of the best options to cover multiple market segments. Meyer and Lehnerd [15] proposed a market segment model where they

showed that how with a product platform different market segments can be covered with vertical, horizontal and beachhead approaches. Another challenge is the combination of platform strategies (multilayer, multi-company): By combining multilayer platforms or by sharing platform development with other companies even higher synergy effects might be reached.

After high investments in product platforms projects, product platforms might be a barrier for innovation. Because of the high number of stakeholder, considering the right time frame for the next generation is a specific challenge for product platform development.

These extract of product platform specific decisions gives additional arguments for a specific treatment of PPDP.

4. Risk management in product platform development projects

Product platform development projects may possess many positive effects; nevertheless they are not free of risk. Tatikonda [21] termed platform projects as highly uncertain in comparison to derivative projects considering the organizational information process theory perspective. Halman et al. [5] argue that in firms insufficient knowledge prevails about risks of product platform development (PPDP) projects themselves and the way to handle them. Although there are many similar risks in product platform development and product development projects, they are partly different. Both types of projects have regular project management risks like failing targets in terms of quality, time, and budget. But the output of a platform development projects often has only a limited, internal market. So platform project leaders might face the risk to miss the requirement specifications of future derivative product projects. Platform projects fail if there is no use case in derivative projects for the platform within the company. In addition, the effects of decisions within the PPDP have a wider range in coverage – in terms of time (till start of production) and coverage of product lines. Therefore platform projects are challenging and have a high investment risk [7].

However, the long planning horizon, indirect risks of platform based product development projects (PBPDP), and the long usage time of product platforms make PPDP special. Harland & Uddin [7] have identified product platform development specific risks, like platform obsolescence risks, long range planning risks (especially regarding customer requirements), risks of too less distinctiveness of products, misfit of certain customer requirements risks and overdesign risks by using the platform. They have categorized the found risks in three categories: Risks in setting up PPDP, risks involved within PPDP, and risks arising in the implementation of product platforms within PBPDP. There are also additional risks which can be termed as failing to achieve the objectives of projects e.g. failing to reduce cost or time to market etc. [7].

Harland & Uddin [7] proposed a framework to mitigate the specific risks in product platform development risks. They argued that risks in platform projects have its own

characteristics and require a more future oriented mind-set. To successfully adapt the risk management framework, emphasise has to be given on both, direct risks of platforms as well as indirect risks of platform based products, to adapt more proactive approaches of risk management, to consider longer time spans for prediction of platform risks, and to secure a reliable risk reporting usable for PBPDP after finalizing the PPDP.

Conclusion

In all analysed field (objectives, expected effects, challenges, decisions, and risk management) we identified differences between product development projects and product platform development projects. Tasks, challenges, decisions and risks in product platform development projects (PPDP) are specific. PPDP are special compared to other product development projects in the sense that it requires a future oriented mind-set considering all possible technology and market changes. The product platform itself is not static but has to be adjusted through generations. Certain positive effects are achievable if proper decisions and plan are adopted. Not only that threat of possible risks can be also minimized if platform specific aspects are incorporated in the risk management process e.g. indirect effects, long term visions etc. Therefore, learning the characteristics of product platform can help preparing the firms to be aware of possible situations and to deal with it easily. Especially because of high complexity, the high number of interactive decisions, uncertainties in technologies and customer requirements, specific challenges in risk management companies in several industries might consider to establish an own project type for product platform development projects.

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Selected Problems of Valuation of Self-Produced Inventories

Abstract

This paper deals with the core problem of any financial accounting system, namely valuation of one kind of assets of a company. Inventories create a significant portion of the assets of manufacturing enterprises. They may be purchased externally or created within a company. It is necessary to devote a special attention to inventories created through the company´s internal activities. The method of their valuation is based on the characteristics of the production process. Simultaneously, the valuation approach must be such as to avoid overvaluation or undervaluation of assets. The selected method of valuation of products does not affect only the value of assets, but it will be significantly reflected by changes of inventories into the economic result, and thus into the tax base. Integrally, it will have an impact on the fundamental financial statements and the related calculations of indicators of financial management. In specific production conditions of a given company, a case study demonstrates how the economic result may be impacted by adoption of either of the two alternative valuation methods. Currently, the company evaluates its self-produced inventories on the basis of direct costs. In correspondence with the nature of the manufacturing process, however, the company could also include their overheads into the valuation process.

Key Words

inventories, costs, economic result, valuation, overheads

JEL Classification: M41, M48

Introduction

Every asset, financial as well as real has a value. The key to successfully investing in and managing these assets lies in understanding not only what the value is, but the sources of the value. [12] In most accounting entities, inventories represent the most important part of the assets, the management of which belongs among the most significant activities on the axis of the main material, information and value streams. These are funds which the accounting entity consumes in the production process (material). Also, they can be bound in production (work-in-process, semi-finished goods), or, they are an outcome of the manufacturing process (products). [2]

The importance of inventories keeps growing in materially challenging manufacturing processes. As such, we can consider the ones where more than 50 % of the value of the final product is created by the value of material. The value expressed in material efficiency is primarily due to the nature of both the product and the input material price.

These two factors are significantly reflected in the management and evaluation of the effectiveness of the use of provisions. This topic is discussed by a number of theoreticians and practising managers. See, for example, the works of Cardová. The category of material includes a wide range of assets – raw materials, auxiliary materials, operating materials, spare parts, packaging, small tangible assets with a date of use of more than one year, and other movable assets with a date of use up to one year. [11] The author also focuses on what internal decisions are to be taken in the company when defining material. For a proper classification of the property several issues must be respected; in particular, the concrete type of property, purpose of its acquisition, in some cases the length of its use and in others its cost. [11]

Inventories can be either externally acquired or created through the company's own operations. The method of inventory acquisition subsequently influences its specific valuation, which has a major impact in terms of the value of corporate assets, the level of overall performance of an enterprise, and from the product point of view, on costs and profitability of individual products. The importance and method of valuation is studied from various perspectives by numerous authors. As stated by Bohušová and Svoboda, self-produced inventories belong to assets – property which arises in the activities of the accounting entity. Accounting entities can value goods produced in their companies differently in relation to the nature of the manufacturing process. [10]

Valuation of work-in-process and of finished goods affects the financial statements, and impacts both business management and the tax base through the accounts of changes in work-in-process and products. [8] Wells et al. state that the valuation of inventories includes two aspects, namely price and quantity. This is developed by Tyson et al., who treat this issue even further, examining the impact of lean production methods on cost reduction, with subsequent impacts on inventories. The amount of provisions is largely influenced by purchasing strategies and business performance. [9]

The paper consists of two main parts. The first one is focused on the theoretical definition of provisions, their classification and methods of valuation. The second part includes a case study which focuses on the valuation of self-produced inventories of a specific company.

Valuation methods are incorporated in the company's directive, which states that internal prices in financial accounting for work-in-process include the actual costs at the level of direct costs and production overheads. For the semi-finished and finished products direct costs are included.

This paper analyses whether the valuation of self-produced inventories meets the requirements of the Accounting Act. Analyses and comparisons drew upon two methods, the existing method of valuation at the level of direct costs, and, secondly, the method taking into consideration also production overheads. Effects of valuations of self-produced inventories on indicators of financial analysis and financial situation of the company are analysed.

Valuation methods contribute to the explanatory power of financial statements and the fair representation of the financial position of the company in relation to the binding nature of capital and business performance.

1. Methodological Definition of the Concept of Inventories

Inventories belong to the category of assets with a relatively high degree of liquidity. Liquid assets are those assets that can be converted to cash relatively quickly. Inventories can be classified from different perspectives.

According to the method of acquisition, inventories fall into two basic groups: either they are externally procured goods, or self-produced provisions. Accounting definitions of inventories are dealt with in more detail in works of Bulla and in fundamental legislation documents. Recording and accounting of inventory is directed mainly by the following cardinal accounting regulations: the Accounting Act No. 563/1991 Coll., the Decree 500/2002 Coll., and Czech accounting standards, namely ČÚS No. 015. [9] The above list identifies a collection of rudimentary governing texts, while the law contains an option for a choice of valuation methods.

1.1 Self-produced Inventories

In manufacturing and agricultural enterprises, inventories are part of the cycle of current assets, changing their form and value. In a manufacturing company with a longer production process, different stages in the life of provisions must also be financially captured. [3]

- Work-in-process – these are products that have undergone one or several stages of production, but still cannot be considered as a finished product. This category also covers unfinished performance where no material products are created. Semi-finished internally produced goods – as such we consider those products which have not passed all stages but can be used for implementation.
- Products – these are internally produced goods which have undergone all stages of production and are intended for final sale.

A special item in the inventories is represented by animals which are born in the accounting entity and by animals with a lifetime shorter than one year or a price lower than 40 thousand Czech crowns. As an example of animals which belong to inventories, the following ones can be listed: young animals, animals in intensive feeding operations, fish, fur-bearing animals, bees, flocks of chickens, ducks, turkeys and guinea fowl.

2. Valuations of Self-produced Inventories

Valuation of products and other supplies is included in the Accounting Act, Section 25, and in Section 49, paragraph 5 of the Decree on Accounting of Entrepreneurs. Amounts are calculated in dependence on the method of acquisition. Furthermore, we value inventories at the time of acquisition and at the time of their release into use. On the basis of the above stated regulations, Matis et al. list three main important moments for inventory valuation. The author's concept can be interpreted as follows:

- The moment of purchase – inventories are valued at historical cost, depending on the acquisition. Purchased provisions are valued at acquisition costs; self-produced provisions are valued at the production cost.
- The end of the reporting period – the value of inventory may be affected by allowance items or clearance of shortages and damages.
- Decrease as a consequence of consumption or sale

The character of the production process has a decisive impact on the valuation of work-in-process, semi-finished and finished products.

- **Short-term continuous cycle:** In this case, work-in-process is valued only through direct material costs. Semi-finished products are valued through direct material and direct labour costs. Products are treated similarly to semi-finished products.
- **Mass production:** For this type of production, work in progress, semi-finished and finished products are valued through direct costs, which include direct materials, direct wages and other direct costs.
- **Low volume, piece, and custom manufacturing and production with a long cycle:** In this case, work-in-process, semi-finished and finished products can be valued through direct costs together with production overheads.

When the production cycle exceeds the period of 12 months, work-in-process, semi-finished and finished products are valued through direct costs together with both production and administrative overheads.

3. Valuing Self-produced Inventories in Company A

The case study is focused on the valuation of self-produced inventories of the company A, which specialises in manufacturing of glass. Products are currently valued at direct costs. The issue to consider is what impact will be demonstrated on the value of assets, economic result, and subsequently on the financial situation when production overheads are included in the valuation. This step is considered due to the fact that their way of manufacturing is characterized as mass production and, thus, products should be valued at direct costs. With some selected main types of products, their production cycle may be characterised as the long-term one (see point 2), implying that the production overheads could be included in valuation.

To analyse the impact of different methods of valuation, three main products marked as A, B, and C have been selected. Basic data on the direct costs and selling price are listed in Table 1.

Tab. 2 Direct costs of the main types of products [CZK/unit]

Item/ unit	Direct costs			Proportion of direct costs to the selling price		
	Product A	Product B	Product C	Product A	Product B	Product C
Direct material	37.93	32.86	31.13	10.84 %	4.63 %	2.59 %
Direct wages	65.15	192.25	334.31	18.61 %	27.08 %	27.86 %
Direct costs	103.08	225.11	365.43	29.45 %	31.71 %	30.45 %
Manufacturing overheads	92.77	202.60	328.89	26.51 %	28.54 %	27.41 %
Production costs	195.85	427.71	694.32	55.96 %	60.24 %	57.86 %
Other expenses	122.33	217.74	396.59	34.95 %	30.67 %	33.05 %
Total costs	318.18	645.45	1,090.91	90.91 %	90.91 %	90.91 %
Selling price	350.00	710.00	1,200.00	x	x	x

Source: company data and own processing

From the above table it is evident that product C is the one with the lowest material costs while its labour costs are the highest. The proportion of direct costs to the sales price is relatively settled, although there are low-percentage deviations.

Direct costs include, for example, sand, precious metals and packaging materials. Direct wages are wages of individual employees (machine operator, packer). Social and health insurance paid by the employer is part of the direct labour costs at the amount of 34 % of the gross volume of direct wages. Table 2 presents an overview of the produced and sold quantities of given products in the accounting period.

Tab.3 Amount of manufactured and sold products and the inventories [units]

Item	Product A	Product B	Product C
Total amount of production	500,000	450,000	470,000
Total amount of sold production	430,000	390,000	405,000
Inventories	70,000	60,000	65,000

Source: company data and own processing

In the following sections, the impact of the existing method of valuation on economic results is outlined. Then a calculation follows, demonstrating how economic results will be influenced when the valuation method incorporates production overheads. Finally, a comparison of two the valuation methods shows consequent impacts of both of them on the financial situation of the company.

3.1.1 Current Valuation Method

The company values its products on the basis of direct costs. Table 3 shows the calculation of the current valuation with the impact on the economic result.

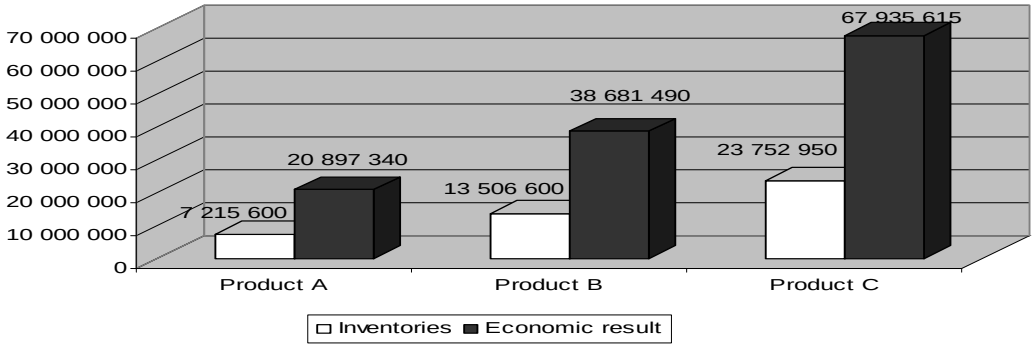
Tab.4 Valuation of products on the basis of direct costs with the impact on economic result [CZK]

Item	Product A	Product B	Product C	Total
Sales	150,500,000	276,900,000	486,000,000	**913,400,000**
Costs of production volume	159,091,000	290,452,050	512,726,290	**962,269,340**
Costs of sales volume	136,818,260	251,725,110	441,817,335	**830,360,705**
Change in inventories	7,215,600	13,506,600	23,752,950	**44,475,150**
Economic result	20,897,340	38,681,490	67,935,615	**127,514,445**

Source: own processing

The highest share of the result belongs to product C, and the lowest to product A. The total inventory comes to 44,475,150 CZK. Figure 1 demonstrates a summary of economic result and inventories of individual product types.

Fig. 1 Impact of valuation on the basis of direct costs on economic results and on the inventories (CZK)



Source: own processing

3.1.2 Valuation Inclusive of Production Overheads

When production overheads at 90 % of the volume of the direct costs are added into calculations, the following values are obtained:

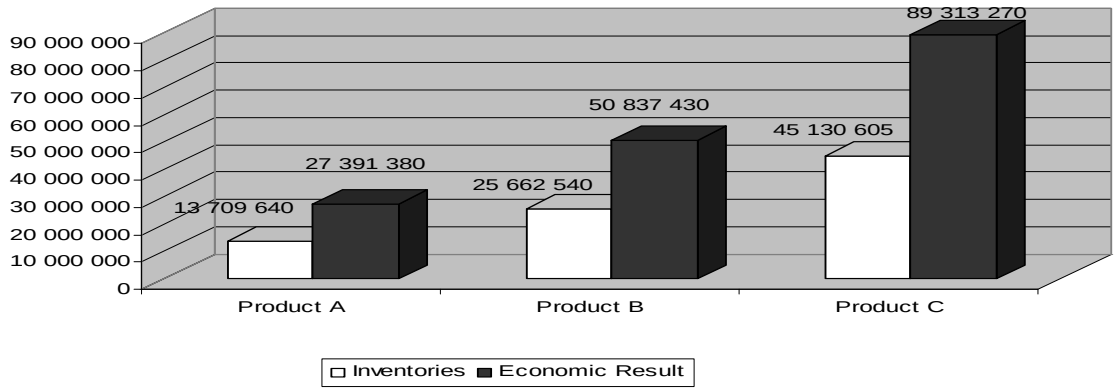
Tab.5 Valuation of products inclusive of production overheads with impact on economic result [CZK]

Item	Product A	Product B	Product C	Total
Sales	150,500,000	276,900,000	486,000,000	**913,400,000**
Costs of production volume	159,091,000	290,452,050	512,726,290	**962,269,340**
Costs of sales volume	136,818,260	251,725,110	441,817,335	**830,360,705**
Change in inventories	13,709,640	25,662,540	45,130,605	**84,502,785**
Economic result	27,391,380	50,837,430	89,313,270	**167,542,080**

Source: own processing

The total economic result for the financial year was increased by 31.4 % to CZK 167,542,080. Correspondingly, the total value of inventories rose by 52.63 % to the amount of CZK 84,503,717. The highest proportion of the value of inventories and the amount of the economic result is linked to product C. Figure 2 presents a graph with the impact of changes in the valuation of each product type on the total value of inventories and on the economic result.

Fig. 1 Valuation impact on the basis of direct production costs on the economic result and amount of inventories (CZK)



Source: own processing

4. Impact of the Method of Valuation on a Company Financial Situation

Valuation method influences the structure of direct costs per unit as shown in Table 5. With respect to structure, valuation impact reaches only economic results.

Tab. 5 Structure of direct costs for one production unit

Proportion of product to	Valuation on the basis of direct costs			Valuation inclusive of production overheads		
	Product A	Product B	Product C	Product A	Product B	Product C
Revenues	16.48 %	30.32 %	53.21 %	16.48 %	30.32 %	53.21 %
Production costs	16.53 %	30.18 %	53.28 %	16.53 %	30.18 %	53.28 %
Sales cost	16.48 %	30.32 %	53.21 %	16.48 %	30.32 %	53.21 %
Inventories	16.22 %	30.37 %	53.41 %	16.22 %	30.37 %	53.41 %
Economic result	16.39 %	30.33 %	53.28 %	16.35 %	30.34 %	53.31 %

Source: own processing

In terms of financing a business entity, the value of current assets represents the required amount of funds needed to cover all means. What follows from this is that the higher valuation of current assets gets, the higher values are bound by those means.

Capital needs in the area of inventory arise when supplies are purchased; they last through the period of storage. They grow as a result of processing, storage of finished products, duration of claims, up to the moment when the invested financial means return. Capital needs are significantly affected by the price of inputs, technology, and the length of the production process, but also by the quality of relationships with business partners.

From the previous sections it is clear that the method of valuation gets reflected in the selected indicators of the financial analysis, such as return on aggregate capital, return

on one's own equity and liquidity. Changing valuation methods will also alter the indicator of material intensity and the coefficient of commitment.

Conclusion

For businesses with a manufacturing character, inventories are essential not only in terms of structuring and accounting procedures, but also in terms of valuation, which significantly affects inventories and other indicators. The Accounting Act and other regulations distinguish externally purchased inventory valuation and valuation of internally produced goods. For externally purchased inventory, the purchase price is given as the base for valuation. For products manufactured within a company, it is necessary to characterise the nature of the production process prior to valuations. Based on this classification, it is clear what costs can be included in the calculations.

This article attempts to answer the question whether the company values selected types of inventories in compliance with legislation in order to avoid overestimation or underestimation of the company's assets. The production process is characterized as a mass production, in which the self-produced inventories are valued in the amount of direct costs. Based on these legislative conditions, the method of valuation of the company is correct. If the classification of the production were changed into the one with a long production cycle, manufacturing overheads could be added to the value of self-produced inventories.

The aim of the case study was to demonstrate how the current valuation method of semi-finished products based on direct costs gets reflected in the economic results, and contrast it to the valuation method based on the actual costs of production inclusive of production overheads. If semi-finished products are valued at direct costs, inventory is logically lower than when production overheads are included.

Changing valuation methods results not only in the change of the value of assets, but it also alters the amount of economic result, which, in this particular case, shows a sharp decline.

The paper clarifies that the economic situation of a company is significantly influenced by decisions taken about what costs and at what amount are to be included in the valuation. Company A values self-produced inventories in accordance with the conditions set out in the Accounting Act. The initial amount of valuation at direct cost does not cause overestimations of assets. Should the nature of production match the long-term process, production overheads would be included in the valuation, and, therefore, even in this case, the legal requirements would be met.

This article was based on research connected with PhD thesis that is focused on valuation of assets and liabilities and its influence on the company value. Valuation of assets has an important effect on calculation of company value.

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Economic and Innovation Adaptability of Regions in the Czech Republic

Abstract

The article is focused on assessment of regional adaptability in the Czech Republic and capability of regions to respond to changing economic environment where innovations and growth of the region's innovation potential plays important role. The research goal is analysis of development trajectories of regions in the Czech Republic and assessment of cohesion of economic changes with respect to the development processes in the fields of innovations. The development processes have been analysed on a group of macro-economic data (inflow of direct foreign investments, development of unemployment rate, development of population, development of gross wages, development of gross domestic product per capita) and indicators (growth of employment in R&D, increase of expenses for R&D, growth in number of innovation businesses and increase of university-degree persons) that analyze regional differences in the innovation potential at the level of regions of the Czech Republic. The data analysis revealed certain dependency among the regions of higher economic potential and innovation dynamics that supports ability of economically stronger regions to create better conditions for development and implementation of innovations. The research also confirmed differences in economic development between structurally impaired and economically undeveloped regions that adapt to economic changes slowly due to weaker economic potential while displaying lower dynamics of change to growth of the innovation potential.

Key Words

regional adaptability, regional resilience, regional development, innovation, transformation, regional economy

JEL Clasification: R11, R 12, O18

Introduction

Importance of so-called regional resilience and regional adaptability [5, 6, 10, 13, 18], i.e. capability of the regional environment to implement new economic impulses and to soften negative economic and social impacts are currently considered in the research of the regional development in association with the regional competitiveness [2, 9, 21]. For example Simmie, Martin [18] define four basic responses of the regions to shock changes where the regional resilience may be reflected in neutral, negative as well as positive impact on the regional development.

At present, there are also many articles dealing with the analysis of the regional resilience [14, 6] or of the state-level resilience [5], which supports the regional

resilience concept topicality for the research of impacts of the economic crisis on the regional development. At the level of regions, the regional framework created in this way produces specific environment of convergence and divergence development processes [7] that reflect different capability of implementation or development of new innovations.

Whereas in the 1990s we were talking about economic transformation resulting in principal change to regional development trajectories (e.g. in Moravian-Silesian Region or Ústí Region), we can monitor these transformation processes in the capability of the regions to adapt to economic changes due to economy growth decline across the European Union. According to Blažek, Csank [1], the divergent processes were terminated after 2000 and new, already stabilized spatial template of regional development level in the Czech Republic was created. However, the economic development is continuous process that may bring new development impulses and impacts on regional economies on continuous basis.

Schumpeter's analysis of benefits of innovations for economic growth [17] became the foundation for other works involved in importance of innovations for economic growth. The innovations and research and development expenses are the tool for increased competitiveness, productivity of production factors, and improvement of economic growth [15]. Quality research and tertiary education are important for reinforcement of the innovation potential and this is also associated with the need of developing of the region innovation systems [4]. The development of innovation environment in the theoretical point [12] of view emphasized importance of linking between private and public sector for cultivation of innovative and productive environment. Proven mechanisms of knowledge transfer and innovations require a cooperation between business and R&D sector at the regional, national, and international level.

The inflow of direct foreign investments [8], which contributed to the growth of external competitiveness and added value, was the key for economic development of the national and regional economies in the Central Europe. The effect of the foreign direct investments on the transfer of innovation and new knowledge also resulted in improved integration of economies into European and global market mechanism. The determinants of the foreign direct investments based on which attractiveness of national and regional economies was assessed include a set of factors such as industrial tradition, education level of citizens, economic and political stability, and particularly attractive geographic location of the territory in relation to Western countries.

The research goal is capture and analysis of development trajectories of regions in the Czech Republic and assessment of cohesion of economic changes with respect to the development processes in the fields of innovations. The research focus follows from the fact that the economic development is significantly cohesive with the social and demographic development in many aspects and evokes differentiated responses at the region level. According to Bristow [2], the regional resilience is also a relevant tool for creation of regional policies and regional development strategy. It could also be used for analyses and determination of priorities and capacities in the field regional policy [19] focused on entrepreneurship [20, 3] or city marketing [11].

1. Research methodology

It is suitable to use a wide range of indicators for analysis of the regional development processes that are sufficiently representative with long-term statistical monitoring. The paper will use a group of selected indicators that sufficiently describe main development changes in the selected fields of transformation of the regional economy. The first analyzed data range includes indicators based on the main macro-economic indicators, whereas the other group of the indicators of interest is based on the field of criteria focused on innovative potential of the region. In the field of macro-economic data, the group of indicators was used, whereas the first is development of GDP per capita [5] and its difference between distant periods from 2001 to 2010. For the purpose of evaluation of the development trajectories, the development of GDP per capita in the period of question provides rather representative view on monitoring of the economic development of the region.

This sub-category also monitors accumulated inflow of foreign investments [for example 8] from 2001 to 2010 (per capita,in CZK). The importance of said criterion (sum of annual volumes of foreign investments from 2001 to 2010) lies in elimination of impact of annual fluctuations in the inflow of foreign direct investments that is associated with the progress of the economic cycle of global economy to a certain extent. Regional labour markets represent unemployment rate and their change between 2001 and 2010. Another indicator that points out the development of economic potential of regions is the indicator of average salaries and their growth (in %) during the monitored period from 2000 to 2010 because growth in gross monthly wages depends on the level of economic development of region and profitability of local companies. When analysing the resilience of regions to the crisis, the last monitored indicator is comparison of development in the number of inhabitants between 2001 and 2010 (in %). This type of demographical indicator is applied e.g. by Chapple, Lester [10] in the analysis of the regional resilience.

The second monitored area, where comparisons of development-based processes were performed, was the field of innovations. For this category, several types of indicators were selected. The first indicator analyses growth of employment in research and development (in %) with respect to either increase or decrease of R&D headcount in 2001 – 2010, which points out to capability of the regions to create qualified jobs associated with development of innovations. The second indicator (R&D expenses from public and private resources) is a growth of R&D expenses (in %) between 2001 and 2010 paid in individual regions of the Czech Republic. The regional differences in the institutional structures are monitored by the indicator of growth of number of innovative businesses (in %) where data for period from 2001 to 2010 was used due to limited availability of information. The last indicator in this category was calculated from growth of share of persons in the region with university education (in %) between 2001 and 2010. The share of university-degree educated inhabitants was used by Chapple, Lester [10] in the analysis of the resilience of regional labour markets in the USA.

2. Development trends of the regional economies in the Czech Republic

The first part of the review focused on the main selected macro-economic indicators. Table 1 shows calculated data and its changes between 2001 and 2010. Volume of the foreign investments between 2001 and 2010 was higher in Prague. Substantially higher values compared to other regions in the Czech Republic are associated with Central Bohemian Region.

Tab. 1 Development of macro-economic indicators of regions in the Czech Republic between years 2001 – 2010

Region	IFDI 01/10	IWG 01/10	IUNEM 01/10	IPOP 01/10	IGDP 01/10
South Bohemian Region	914.2	73.1	-2.5	2.3	47.7
South Moravian Region	762.0	66.3	-1.1	2.0	57.7
Karlovy Vary Region	593.7	58.9	-2.7	1.2	41.8
Hradec Králové Region	513.9	63.7	-2.1	1.0	45.3
Liberec Region	999.9	68.2	-3.2	2.9	33.0
Moravian-Silesian Region	902.2	61.6	2.8	-1.4	65.3
Olomouc Region	457.5	65.9	-0.7	-0.2	51.3
Pardubice Region	746.4	64.0	-1.9	2.0	46.6
Plzeň Region	968.3	66.7	-1.7	4.1	41.5
Praha	6824.0	45.4	-0.7	8.4	63.3
Central Bohemian Region	1432.0	73.5	-1.0	12.5	51.1
Ústí Region	991.1	83.5	4.7	2.0	64.0
Vysočina Region	821.0	67.8	-3.7	0.6	44.0
Zlín Region	570.6	61.3	-2.2	-0.6	58.1

Note: IFDI – accumulated inflow of foreign direct investments per capita between years 2001 and 2010 (in CZK), IUNEM – differentiation between unemployment rates in years 2001 and 2010 (in %), IPOP – population growth between years 2001 and 2010 (in %), IWG – growth of gross wages between years 2001 and 2010 (in %), IGDP – growth of GDP per capita between years 2001 and 2010 (in %)

Source: own research based on data of Czech statistical office

In case of the inflow of foreign investments, the comparison of other regions with Prague is rather unsuitable because Prague as the capital city with registered offices of central branches of foreign companies has a different position. The lowest volume of foreign direct investments was recorded in Olomouc, Hradec Králové and Zlín regions where the volume achieves roughly one third of the FDI per capita in Central Bohemian Region. The increase of gross wages index between 2001 and 2010 is the indicator of lower variability level. Rather surprising fact is that Prague saw the least increase of average wage from among all regions, which is due to long-term above-average level of average wage in this region that is higher than the average in the Czech Republic from the longer point of view. Lower increase of gross wages was also seen between 2001 and 2010 in Karlovy Vary Region (+58.9 %), Zlín Region (61.3 %). On the other hand, the highest increase of gross wages was seen Ústí Region (+83.5 %).

Development of the unemployment rate index between 2001 and 2010 shows unemployment rate drop and growth in case of positive and negative figures, respectively. The calculated values point out to capability of structurally impaired regions, which are generally those with obsolete industrial potential, to reduce unemployment level. In these regions, i.e. Moravian-Silesian Region and Ústí Region, the highest unemployment drop was reported and this fact must be seen in the context of original values early in the beginning of the period in question when the unemployment rate was much higher than in other regions of the Czech Republic. No significant changes were observed in the regions with stabilized low unemployment rate.

Prague and Central Bohemian Region clearly dominate in the population growth over the other regions; the growth of Central Bohemian Region is caused its function as a background for Prague and they together produce the most migration attractive region in the Czech Republic. The highest GDP growth was recorded in Moravian-Silesian Region, Prague and Ústí Region; on the other hand, the lowest GDP growth was seen in Liberec Region, Plzeň Region and Karlovy Vary Region.

Tab. 2 Development of innovation potential of the regions in the Czech Republic

Region	ILAB 01/10	ITER 01/10	IEXP 01/10	IEN 01/10
South Bohemian Region	110.2	*69.2*	162.2	20.2
South Moravian Region	132.4	*60.7*	74.6	19.9
Karlovy Vary Region	-9.6	*34.0*	21.1	32.0
Hradec Králové Region	166.5	*68.5*	41.2	18.2
Liberec Region	104.3	*74.1*	19.7	24.6
Moravian-Silesian Region	110.2	*69.2*	38.9	27.9
Olomouc Region	128.4	*46.7*	18.1	14.1
Pardubice Region	87.2	*53.9*	18.8	27.9
Plzeň Region	119.0	*74.1*	41.5	17.5
Praha	84.8	*61.1*	32.0	21.9
Central Bohemian Region	86.4	*140.9*	17.4	18.2
Ústí Region	44.3	*58.2*	10.7	27.5
Vysočina Region	119.1	*75.6*	-8.6	28.8
Zlín Region	127.1	*66.9*	0.8	26.6

Note: ILAB – growth of employees in R&D between years 2001 and 2010 (in %), ITER – growth in number of university-degree persons in population between years 2001 and 2010 (in %), IEXP – growth of R&D expenses between years 2001 and 2010 (in %), IEN – growth of number of innovative businesses between years 2001 and 2010(in %).

Source: own research based on data of Czech statistical office

In the field of evaluation of the development of innovative potential of regions (Tab. 2), the changes to the field of human resources, R&D expenses and changes to the number of innovative businesses were analyzed. Prague is characterized by high number of R&D staff in long-term run and where more employees would be needed to achieve comparable increase in per cents. However, generally lower growing dynamic is reported by Ústí Region, Central Bohemian Region and Pardubice Region with substantially lower increase in the number of R&D employees compared to other

regions. Should we monitor changes to share in persons with university degree in general population, Central Bohemian Region is ranked first followed by Vysočina Region, Plzeň Region and Liberec Region. The lowest growth in persons with university-degree education in the population between 2001 and 2010 was reported in Karlovy Vary Region as well as Olomouc Region.

Another indicator, which monitored growth of expenses to R&D between 2001 and 2010, reported the highest increase in South Bohemian Region. Second was South Moravian Region, particularly due to role of the city of Brno that becomes one of the most important research and development centre in the Czech Republic. Plzeň Region ranks third, which is the case similar to South Moravian Region because the city of Plzeň dominates here, which is one of the biggest cities in the Czech Republic as well as the key centre of the economic development. The last investigated indicator was the growth in number of innovative businesses between 2001 and 2010; because of limited data availability, regional data for these years were used. Low increase in Prague may not be seen negatively because there are many innovative businesses in Prague with high margin compared to other regions. On the other hand, Olomouc Region, despite rather high number of innovative businesses at the beginning of the period of question, reports very low increase in their number and therefore, it ranked last.

3. General assessment of the regional adaptability

The data for the indicator of the economic growth and indicator of growth in the innovation potential was first standardized in order to allow comparison. These indicators were calculated from Tab. 1 (indicator of economic growth) and Tab. 2 (indicators of growth of innovative potential). The average values for individual indicators were determined including standard deviation used for obtaining of positive and negative values for each region, where positive number stands for above-than-average value and negative number stands for lower-than-average value when compared to average for the field in question.

The purpose of categorization of the regions into groups (Tab. 3) was to define three categories of regions of similar size: a) with higher dynamics of economic changes, b) average dynamics, c) lower-than-average dynamics. The first group consists of Prague and Central Bohemian Region, which are the regions with above-than-average economic development level in long-term run and they reported stable and high economic dynamics between 2001 and 2010. South Moravian Region is an example of the region of very strong and dynamic growth centre in Brno and its background having impact on results of the region as a whole. Rather surprising are the aggregated results of Moravian-Silesian Region and Ústí Region, being the regions regarded as structurally impaired in long-term run where industrial and mining activities undergo long-term restructuralization [16]. Compared to the second category of economically underdeveloped regions, both regions have great economic potential despite structural problems. Favourable location of these regions also supports positive results of ongoing economic restructuralization of the regional economies.

Tab. 3 Categorization of regions according to aggregated indicator of the economic growth

Intensity	Value	Region
higher	more than 0.3	Ústí Region, Prague, Central Bohemian Region, Moravian-Silesian Region, South Moravian Region
average	from 0.2 to -1.5	South Bohemian Region, Plzeň Region, Olomouc Region, Pardubice Region
lower	less than -1.9	Zlín Region, Hradec Králové Region, Vysočina Region Region, Liberec Region, Karlovy Vary Region

Source: own research based on data of Czech statistical office

The second area focused on assessment of the innovation dynamics of the regions (Tab. 4) indicates the differences in the structure of regions less significant than in the first area. As far as the growth of innovation dynamics between 2001 and 2010 is concerned, the first category of regions (with higher growth in the innovation dynamics) is now occupied by South Bohemian Region, Central Bohemia Region and Moravian-Silesian Region, whereas Prague moved to the second category and Ústí Region moved to third category. It should be mentioned in case of Prague and Central Bohemian Region that these regions show above-than-average level of innovative potential in the parameters in question. Very good ranking of the structurally impaired region of Moravian-Silesian Region is, however, confirmed by rather successful transformation processes of the regional economy and, in particular, its industrial base.

Tab. 4 Categorization of regions according to aggregated indicator of growth in the innovation potential

Intensity	Value	Region
higher	more than 1.3	South Bohemian Region, Central Bohemian Region, Moravian-Silesian Region
average	from 1.2 to -0.4	South Moravia Region, Hradec Králové Region, Vysočina Region, Zlín Region, Liberec Region, Plzeň Region, Pardubice Region
lower	less than -0.5	Prague, Ústí Region, Olomouc Region, Karlovy Vary Region

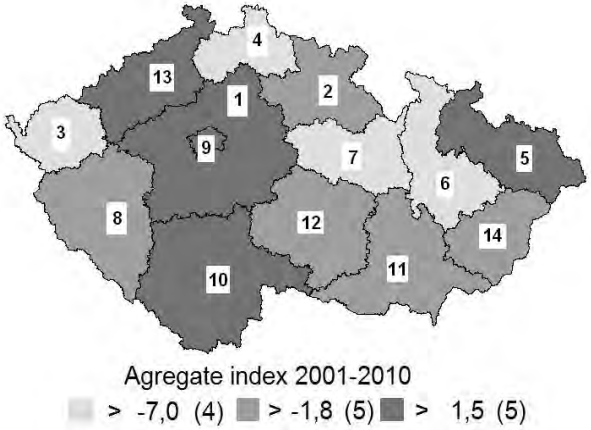
Source: own research based on data of Czech statistical office

Lower intensity of macro-economic development changes is also reflected in the category of regions with lower growth of the innovation potential (for example) Karlovy Vary Region. Figure 1 (below) shows categorization of these regions (indicator of the economic growth and innovation potential together). This result points out to weaker potential of the transformation processes that are reflected in a lower level of social and economic changes of said regions. Rather surprising is ranking of Liberec Region, which – contrary to other regions – is more industrialized, offers good transport infrastructure to Prague and Central Bohemia, particularly to concern Volkswagen (Škoda).

Summarized assessment of macro-economic and innovation intensity points out to relative interconnection of both areas in question. Several main findings can be deducted based on said assessment. The regions with long-term stable above-than-average developed economy and higher gross domestic product keep their higher economic growth despite growth in the innovation activity is not so intensive in these regions. Indirectly, growth in Prague shifts to Central Bohemian Region that in fact stands as a social and economic background for Prague and both regions together create growing macro-region in the Czech Republic. Very good results are achieved by South

Moravian Region both in the field of growth of macro-economic data as well as indicators in the field of innovations. Moravian-Silesian Region and Ústí Region, which represent an example of old industrial regions within the Czech Republic, achieve rather good results (in macroeconomic indicators) compared to other regions and this fact can be regarded as an evidence of relatively successful economic transformation.

Fig. 1 Summarized assessment of regions according to dynamics of development changes (2001 – 2010)



Note: 1 – Central Bohemian Region, 2 – Hradec Králové Region, 3 – Karlovy Vary Region, 4 – Liberec Region, 5 – Moravian-Silesian Region, 6 – Olomouc Region, 7 – Pardubice Region, 8 – Plzeň Region, 9 – Praha, 10 – South Bohemian Region, 11 – South Moravian Region, 12 – Vysočina Region, 13 – Ústí Region, 14 – Zlín Region.

Source: own research based on data of Czech statistical office

Conclusion

The research goal is to analyze development trajectories of regions in the Czech Republic and assessment of economic changes with respect to the development processes in the fields of innovations. Data analysis confirmed differences in economic development between categories of structurally impaired and economic underdeveloped regions. Second category of regions, due to lower economic potential, adapt slower to economic changes and higher risk of growing economic differentiation between successful and stagnating regions can be expected. Also revealed was certain dependency among the regions of higher economic potential and innovation dynamics that supports ability of economically stronger regions to create better conditions for development and implementation of innovations to economy.

Some regional economies reported more intensive growth in expenses related to research and development activities. The differences among the regions in intensity of growth in R&D expenses between 2001 and 2010 are rather significant. The regions with lower volumes of expenses at the beginning of the period grow faster, but do not achieve the level of R&D expenses in the regions at average level. However, this trend shows a turnover happening in the regions with lower development of R&D because the area of research and development attempts to be developed more intensively. In this

case, intensive involvement of universities in development of innovations is important, because the regions with absence of innovation-focused universities (Karlovy Vary Region) do not have any significant innovation potential that would be able to get funds for R&D activities. The statistic data of regional distribution of number of jobs in the research and development area provide obvious differences among the regions with public universities because these regions get more funds from public resources.

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Option Pricing with Simulation of Fuzzy Stochastic Variables

Abstract

During last decades the stochastic simulation approach, both via MC and QMC has been vastly applied and subsequently analyzed in almost all branches of science. Very nice applications can be found in areas that rely on modeling via stochastic processes, such as finance. However, since financial quantities as opposed to natural processes depend on human activity, their modeling is often very challenging. Many scholars therefor suggest to specify some parts of financial models by means of fuzzy set theory. Many financial problems, such as pricing and hedging of specific financial derivatives, are too complex to be solved analytically even in a crisp case, it can be efficient to apply (Quasi) Monte Carlo simulation. In this contribution a recent knowledge of fuzzy numbers and their approximation is utilized in order to suggest fuzzy-MC simulation to option price modeling in terms of fuzzy-random variables. In particular, we suggest three distinct fuzzy-random processes as an alternative to a standard crisp model. Application possibilities are shown on illustrative examples assuming a plain vanilla European put option under Brownian motion with fuzzy parameter (volatility), Brownian motion with fuzzy subordinator and Brownian motion with fuzzyfied subordinator. In each case the model result into a whole set of prices – thus, since we assume one of the input data as LU fuzzy number, we get the price in terms of the LU fuzzy number as well. The payoff function of analyzed put option can be obviously replaced by more complex payoff structure.

Key Words

random variable, fuzzy variable, option, simulation

JEL Classification: C46, E37, G17, G24

Introduction

Options, a specific nonlinear type of a financial derivative, play an important role in the economy. In particular, the usage of options allows one to reach a higher level of efficiency in terms of risk-return trade-off, whether through speculation or hedging strategy. The option's holder can exercise his right, eg. buy or sell an underlying asset, when he finds it useful. Obviously, it is the case of positive cash flowing from the option exercising. Otherwise the option matures unexploited. By contrast, the seller of the option has to act according to the instructions of the holder. This asymmetry of buyer/seller rights implies the needs of advanced technique for option pricing and hedging.

The standard ways to option pricing, as well as replication and hedging, dates back to 70's to the seminal papers of Black and Scholes (1973) and Merton (1973), Cox et al. (1979) or Boyle (1977). While Black and Scholes (1973) and Merton (1973) derived their respective models within continuous time by solving partial differential equations (and thereafter called Black-Scholes-Merton partial differential equations) for risk free portfolio consisting of option itself and its underlying asset, Cox et al. (1979) provided an approximative solution in two-stage discrete time setting via recursive backward procedure. Alternatively, Boyle (1979) suggested that in order to obtain the (discounted) expectation of the option payoff function the Monte Carlo simulation technique can be useful, ie. instead of riskless portfolio construction and utilization of no-arbitrage principle the risk-neutral world is assumed. It is a well-known result of quantitative finance, see eg. Duffie (2001), that these approaches are equivalent under the assumption of complete markets, or, at least, when an equivalent martingale measure exists.

Although the aforementioned approaches slightly differ in details, eg. only the model of Cox et al. (1979) can be used for pricing of American options, the general frame is the same – the underlying process is derived from Gaussian distribution and all parameters are either deterministic or probabilistic, ie. particular probabilities are assigned to the set of real numbers. However, in the real world, it is often difficult to obtain reliable estimates to input parameters. The reason can be that sufficiently long time series of data is lacking or the data are too heterogenous. Several research papers collected by Ribeira et al. (1999) suggested that the fuzzy set theory proposed by Zadeh (1965) can be useful for financial engineering problems of such kind.

One of the first attempts to utilize the fuzzy set theory in option pricing dates back to Cherubini (1997). Later, for example Zmeškal (2001) applied a simplifying fuzzy-stochastic approach based on T-numbers to value a firm as a European call option (ie. a real option). The Zmeškal's assumption of real options in (2001) implied that besides the underlying process also the exercise price and maturity time were defined as fuzzy. By contrast, Yoshida (2003) assumed European financial options so that only standard parameters (mainly riskless rate/drift and volatility) were specified as fuzzy. The author also provided more rigorous analytical analysis, including a particular buyer/seller view and hedging possibilities, comparing to quite complicated global optimization approach of Zmeškal (2001). Similarly to Yoshida (2003), Wu eg. in (2004) and (2007) suggested another interesting approach to the treatment of the Black and Scholes model in the fuzzy-stochastic setting. The papers by these three authors were followed by several others, extending the analysis of Black-Scholes type models to eg. more general Lévy processes. Moreover, there exist another direction of research dealing with discrete binomial-type models or utility functions. However, except recent, but brief contribution of Nowak and Romaniuk (2010) there was no attempt to value an option with fuzzy parameters via Monte Carlo simulation approach.

In this paper, we try to fill the gap by suggesting three distinct types of potential underlying processes defined on the basis of fuzzy-random variables. More particularly, we assume (geometric) Brownian motion with fuzzy volatility and (geometric) Brownian motion with time t replaced either by fuzzy process or by fuzzified gamma

subordinator, which allows us to redefine in finance well known and commonly used Lévy type variance gamma model (Cont and Tankov, 2004) in terms of fuzzy-random subordinator. In the next section, we provide brief details about option pricing via plain Monte Carlo simulation within the risk neutral setting. Next, LU-fuzzy numbers and relevant operations with them are defined. After that, three potential candidates to option underlying asset price model are suggested. Finally, a European option price is evaluated assuming all three processes.

1. Standard approach

A financial derivative *f* that provides at maturity time T its owner, ie. party in the long position, a right to buy an underlying asset *S*, ie. a right to exercise the option paying the exercise price *K*, is called *a European call option*. If there is a right to sell the underlying asset, we refer to such derivative security as *a European put option*. There also exist *American options* – the right can be exercised at any time during the option life, and *Bermudan options* – the right can be exercised at prespecified finite set of points during option life. Furthermore, the right to exercise the option can be conditional to additional circumstances, eg. the path followed by the underlying asset price in the past. However, we restrict ourselves only to simple European call and put options, also called *plain vanilla options*. Denoting the underlying asset price at maturity time as S_T we can write the payoff function for European call and put options as follows:

$$\Psi_T^{vanilla\ call} = \left(S_T - K\right)^+ \tag{1}$$

and

$$\Psi_T^{vanilla\ put} = \left(K - S_T\right)^+ \tag{2}$$

respectively. For call option price at time $t < T$ it generally holds that:

$$f_t = e^{d_\tau} E\left[\Psi_T^{vanilla\ call}\right] = e^{d_\tau} E\left[\left(S_T - K\right)^+\right], \tag{3}$$

where a discount factor d_τ relates to the probability measure under which the expectation operator E is evaluated and $\tau = T - t$ is the remaining time to maturity. Commonly, E^P denotes the real world expectation (under physical probability measure), while E^Q is used within the risk-neutral world, ie. , where *r* is a riskless rate valid over time interval τ. Since financial asset prices are often restricted to positive values only, geometric processes are commonly preferred. If, for example, $Z(t)$ denotes a stochastic process for log-returns of financial asset *S*, eg. a non-dividend paying stock, to model its price in time we have to evaluate the exponential function of $Z(t)$. It follows that under Q the key formula above can be rewritten into:

$$f_t = e^{-r\tau} E^Q\left[\left(S_T e^{r\tau + Z_\tau^Q} - K\right)^+\right], \tag{4}$$

where Z_τ^Q is a (potentially compensated) realization of a suitable stochastic process over τ such that it is ensured that *S* is a martingale.

The optimal choice of Z_τ^Q depends on the assumptions (observations) about the returns of the underlying asset. If the process is sufficiently tractable, it can be solved

analytically leading to closed form formula, see eg. risk-neutral derivation of Black-Scholes model in Shereve (2004). Alternatively, we can utilize the law of large numbers and evaluate the expectation via Monte Carlo simulation, ie. sufficiently large number of independent scenarios is taken from the relevant probability distribution of (see eg. Glasserman (2004) or Broadie et al (1997) for comprehensive review of this technique):

$$f_t = e^{-r\tau} E^Q\left[\left(S_T e^{r\tau+Z_\tau^Q} - K\right)^+\right] \approx \frac{e^{-r\tau}}{N}\sum_{i=1}^{N}\left(S_T e^{r\tau+Z_\tau^{Q(i)}} - K\right)^+, \tag{5}$$

where superscript (*i*) refers to *i*-th scenario from a given probability space. Obviously, if the information available about the source of uncertainty is not sufficient to select a reliable candidate for its stochastic evolution, one can prefer to replace Wiener process *Z* by a fuzzy-stochastic variable.

2. Fuzzy sets theory

Let *R* denotes the set of real numbers. A fuzzy number is usually called a mapping, which is normal (ie. there exits an element such that), convex (ie. $A(\lambda x+(1-\lambda)y)\geq\min(A(x),A(y)$ for any $x,y\in R$ and $\lambda\in[0,1]$), upper semicontinuous and *supp*(*A*) is bounded, where $supp(A)=cl\{x\in R|A(x)>0\}$ and *cl* is the closure operator. The most popular models of fuzzy numbers are the triangular and trapezoidal models investigated by Dubois and Prade (1980). Their popularity follows from the simple (fuzzy) calculus as addition or multiplication of fuzzy numbers which can be established for them. This is also a reason why we can find many recent papers on the approximation of fuzzy numbers by the mentioned models (see eg. Ban (2009a,b) and the references therein).

2.1 LU-fuzzy numbers

In order to model fuzzy numbers we will use a more advanced model of fuzzy numbers based on the interpolation of given knots using rational splines that was proposed by Guerra and Stefanini in (2005) and developed in (2006). This model generalizes the triangular fuzzy numbers and gives a broad variety of shapes enabling more precise representation of fuzzy real data, nevertheless, the calculus is still very simple.

It is well known that each fuzzy number has a representation using α-cuts. Recall that α-cut of a fuzzy number *A* is the common set and:

$$A(x) = \bigvee_{\substack{\alpha\in]0,1] \\ x\in A_\alpha}} \alpha\,. \tag{6}$$

Since the fuzzy numbers are upper semicontinuous real functions, then each α-cut may be replaced by its endpoints, say *u* for the left endpoint and *v* for the right endpoint. Hence, each fuzzy number can be completely represented by two functions *u, v* such that:

1. *u* is a bounded monotonic non-decreasing function which is left-continuous on]0,1] and the right-continuous for α=0,

2. v is a bounded monotonic non-increasing function which is left-continuous on]0,1] and the right-continuous for α=0,
3. $u(\alpha) < v(\alpha)$ for any $\alpha \in [0,1]$.

The arithmetic operations between two fuzzy numbers A and B represented by pairs of functions can be introduced using a suitable manipulation of the functions u and v. For example, $A+B$ can be simply obtained by adding respective bounds. For further definitions of arithmetic operations, we refer to Stefanini et al (2006). Since the modeling of fuzzy numbers and the manipulation with them is not so simple in general, we use the parametric representation of fuzzy numbers proposed by the same authors.

3. Potential candidates for price modelling

As we have already argued, it can be very difficult to obtain reliable estimates for the parameters (eg. volatility or intensity of jumps) of the stochastic process $Z(t)$. It is the reason why many researchers suggest to define the underlying process in terms of fuzzy or fuzzy-random variables. In this section, three distinct fuzzy-random models are suggested as potential candidates to describe the option underlying asset price process; in particular, we assume (i) standard market model (Brownian motion) with fuzzy parameter, (ii) Brownian motion with fuzzy subordinator, and (iii) Brownian motion with fuzzyfied gamma subordinator.

Model 1 (standard market model with fuzzy parameter)

Let σ_{LU} be an LU-fuzzy number defined around crisp estimation of σ. Then we can model price returns by the following fuzzy-stochastic model:

$$Z(t) = \mu t + \sigma_{LU}\sqrt{t}\varepsilon . \tag{7}$$

Model 2 (Brownian motion with fuzzy subordinator)

Let x_{LU} is a non-negative LU-fuzzy number centred around t so that it can be a subordinator. Then we get the following alternative to the common assumption of Brownian motion:

$$Z(t) = \theta g(t) + \vartheta\sqrt{g(t)}\varepsilon . \tag{8}$$

Model 3 (Brownian motion with fuzzyfied gamma subordinator)

Let g_{LU} is an LU-fuzzy number centred around random gamma variable. Then we can get another alternative model by using g_{LU} as a subordinator to the Brownian motion:

$$Z(t) = \theta x_{LU}(t) + \sigma\sqrt{x_{LU}(t)}\varepsilon . \tag{9}$$

4. Results

In order to evaluate the risk-neutral expectation via Monte Carlo simulation, we need to get models of the preceding section into the exponential and choose a proper ω_{LU} such that the complex process will be martingale when discounted by the riskless rate.

Comparative results of particular models for various input data are provided in Table 1. Let us assume put options written on stock price index in the form of a mutual fund price. For the illustrative example we derive the input data from the price observations of Pioneer stock fund over 5 years. The idea is that such option can serve as

Tab. 1 Output table of pricing algorithm for put options when various models are considered

	Model 1 (BS model with fuzzy volatility σ_{LU} $S_0 = 100$, $K = 100$, $r = 0$, $T = 1$	
$\sigma_m = 0.15$ $\sigma_s = 0.10$	$\begin{pmatrix} 1.22 & 3.10 & 6.76 \\ 227 & 209 & 7023 \end{pmatrix}$	$\begin{pmatrix} 22.56 & 14.66 & 6.76 \\ -138 & -161 & -7023 \end{pmatrix}$
$\sigma_m = 0.25$ $\sigma_s = 0.10$	$\begin{pmatrix} 1.15 & 3.78 & 8.85 \\ 235 & 202 & 8773 \end{pmatrix}$	$\begin{pmatrix} 26.75 & 17.22 & 8.85 \\ -128 & -148 & -8773 \end{pmatrix}$
$\sigma_m = 0.25$ $\sigma_s = 0.05$	$\begin{pmatrix} 1.04 & 2.90 & 5.73 \\ 208 & 207 & 35\,241 \end{pmatrix}$	$\begin{pmatrix} 14.33 & 9.28 & 5.73 \\ -155 & -180 & -35\,241 \end{pmatrix}$
	Model 2 (Brownian motion with fuzzy subordinator x_{LU} $S_0 = 100$, $K = 100$, $r = 0$, $T = 1$, $\sigma = 0.15$	
$\theta = 0.00$ $x_{LU} = [0.75, 0.25]$	$\begin{pmatrix} 3.73 & 4.83 & 5.93 \\ 12.5 & 13.0 & 693 \end{pmatrix}$	$\begin{pmatrix} 8.20 & 7.14 & 5.76 \\ -138 & -161 & -7023 \end{pmatrix}$
	Model 3 (Brownian motion with fuzzyfied subordinator $g_{LU}(g(t))$ $S_0 = 100$, $K = 100$, $r = 0$, $T = 1$, $\sigma = 0.15$	
$\theta = 0.00$ $\nu = 0.85$	$\begin{pmatrix} 0.44 & 1.75 & 6.15 \\ 725 & 530 & 367 \end{pmatrix}$	$\begin{pmatrix} 19.63 & 13.77 & 6.15 \\ -1\,028 & -661 & -367 \end{pmatrix}$

Source: own calcultaions

Generally, we assume crisp values of initial price of the underlying asset (S_0 = 100), exercise price (K = 100), riskless rate (r = 0) and maturity (T = 1). Model 1 (first panel) is similar to BS model, except that the volatility of underlying asset price returns is defined as fuzzy random LU number over normal distribution N(0.15; 0.1), with s = 0.15 being the most commonly observed value. For sensitivity reasons, we also consider N(0.15; 0.05) and N(0.20; 0.1).

By contrast, Model 2 (second panel) provides us the results of Brownian motion with subordinator defined as fuzzy random LU number over uniform distribution U(0.5; 1.5). Within the model, a symmetry of log-returns can be assumed or it can be relaxed by setting suitable θ to obtain either positive and negative skew. Similarly, in the last panel, the fuzzy-option price assuming Model 3 is depicted for fuzzy random gamma process with variance parameter 0.85 allowing again both, symmetry and asymmetry of log returns by setting suitable θ.

Conclusion

Many issues of financial modeling and decision making require some knowledge about the future states. However, sometimes it is very difficult to get reliable parameterization of stochastic models. In this contribution we suggested an alternative approach to option valuation problem via Monte Carlo simulation by specifying three distinct types of fuzzy-random processes. Suggested models of financial returns can have very interesting impact on option pricing and hedging. First we should note that the BS option price would be really close to the mid-price of each resulting LU-fuzzy price.

Suggested approach opens a wide scope of application possibilities of fuzzy stochastic LU fuzzy numbers in option pricing, especially in cases when the knowledge about the input data do not justify application of more standard approaches based on stochastic variable.

In subsequent research, it can be interesting to study the effect of particular parameters on fuzzy-option price, compare it to real market data as well analyze the convergence of fuzzy-Monte Carlo simulation.

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Market Analysis for Language Services in the Czech Republic

Abstract

The paper analyses specific parts of the questionnaire survey implemented under a project entitled "Market research for language services". The aim of the research was to obtain background data to implement the required market analyses for language services and formulate recommendations as to the applicant's future business strategy. The purpose of the submitted article is to analyse the attributes relevant to the selection of a company active in the field of language service provision. To this end, literary reviews and primary data collection were undertaken. The data collection was competed by means of a questionnaire survey with companies established in the Czech Republic. The selection method used for the respondents was "random quota selection". A combination of electronic and on-the-phone interviewing was used for the primary data collection. In formulating specific questions closed multiple choice questions were used with the respondents having to choose from a group of clearly defined answers. Relative scales were used for a certain proportion of the questions where the respondents expressed the degree of importance. The collected data were treated by a description process, at which the values of the underlying statistic quantities and frequency of certain replies were processed. It may be stated based on the investigation completed that the key factors regarded as the most important by companies in selecting a language service supplier are quality, price, compliance with deadlines and specialised terminology.

Key Words

language services, research, analysis, significance factors, price, quality

JEL Classification: M31

Introduction

The era, which is now referred to as the crisis, also had an impact on the situation in the market for language education. In its context, language schools and companies offering language tuition had to address a drop in the number of their clients (students). The bidding price and tuition quality had an important role to play in the selection of the courses. Quality may be assessed using the language school's programme offered and inferred from its position in the market, experience of the teachers and their educational qualifications. References as provided by existing students should also factor in selecting a language school.

The paper analyses enquiries for language services based on a project implemented in the field of language services. It describes a specific part of the outcome, which concentrates on investigating the attributes important in terms of selecting a service provider in the domain of language services.

1. Project characteristics

The "Market research for language services" project was completed under the G-28 Regional innovation programme grant fund. A questionnaire was compiled in collaboration with expert practitioners with a view to obtaining the background data required to complete the respective market analyses for language services as well as formulate recommendations for the applicant's future business strategy. The main impetus for the project came from the attempts to increase efforts at addressing the long-term issue of missing data relevant to the market situation and development analysis and future prognosis. As a result a reactive rather than a pro-active business strategy concept evolved with the objective being to make the maximum use of the market potential and reinforce the position in the market for language services.

The project aimed to map the situation in the field of interpretation, translation and language tuition in the company sector. Statistical methods were applied to derive conclusions relating mainly to the current patterns and volume of and trends in demand for language services with a prognosis for the future, the method of securing demand for language services by the entities under the survey, attributes relevant to the supplier selection for language services, all broken down by the size of the service providers and fields.

To that end, literary reviews and data collection were undertaken using a questionnaire survey for companies based in the Czech Republic. The companies involved in the survey displayed various legal forms, various staff counts and were distributed evenly throughout the Czech Republic (every Region was represented). The total number of respondents was 415, which makes the data amply representative to yield valid results of the investigation and to be extrapolated to other companies.

2. Methodology

The interviews were led by trained interviewers during a predefined period of time, during May to June 2012. The selection method used for the respondents was "random quota selection". A combination of electronic and on-the-phone interviewing was used for the primary data collection. In formulating specific questions closed multiple choice questions were used with the respondents having to choose from a group of clearly defined answers. Relative scales were used for a certain proportion of the questions where the respondents expressed the degree of importance.

The investigation took place with a representative of the company concerned responsible for education filling in the questionnaire. The overall sample of the consulted respondents totalled 2,500 companies. 415 valid questionnaires were referred to the processing. The return rate was 16.6 %.

In terms of the methods used, the research applied quantitative methods. As regards the purpose of the investigation, the "descriptive purpose" mapping the situation in the market for translation, interpretation and language services as well as the "exploratory purpose" seeking to directly establish the importance of the factors in the service supplier selection process were opted for.

2.1 Types of variables

While processing the data, data description was undertaken where calculations of the fundamental statistic quantities and frequencies of certain replies were processed. The analysis applied three types of variables – nominal, ordinal and cardinal.

- Nominal variables – no quality-related order for the individual phenomenon occurrences is established, which means there is no better/worse relation between the individual values.
- Ordinal variables – may assume a final number of values within the given interval and may be sorted from the qualitative point of view. One example of this is the importance of individual aspects in selecting an external supplier of language service ("definitely important", "rather important", "rather unimportant", "definitely unimportant").
- Cardinal variables – these involve numerical variables where the values have the meaning of numbers. They may be ranked in increasing or decreasing series and may theoretically assume any values from the variable's definition interval. In analysing them, the fundamental descriptive statistics are first assembled with the computation of the fundamental position and variance parameters. Moreover, the fundamental pre-conditions regarding their homogeneity and normality are formulated. [1]

2.2 Statistical evaluation methods

If the fundamental pre-conditions are met, the relations between the individual sets are investigated using statistical methods through the "Statgraphics 16" software. The entire paper operates with significance level of $\alpha=0.05$ unless stipulated otherwise.

The mean value (arithmetical average) is the sum of all values of the random variable x_i divided by the number of the values.

- The confidence interval, $\mu_{1-\alpha}$, is an interval that contains the mean value of the statistical set with a confidence level of $1 - \alpha$.

- The median is a robust position estimate, the mean value of the sorted data, 50%-quantile.
- The variance of the statistical set – $\mu_2(X)$ is the second central moment, variability characteristics.
- Standard deviation – s square root of the estimated set variance.
- Pearson's chi-squared test – for nominal variables, it needs to be established whether there is a statistically significant difference in the representation of the doublets of the individual variables categories at the given α statistical significance level.
- Spearman's rank correlation coefficient – a dimensionless number, which gives the statistical dependency (correlation) between two quantities. [2]

3. Current situation in the market for language services

The economic crisis had a devastating impact on the domestic market for translation services, which, according to expert estimates, annually dropped by up to one fifth. On seeing the number of their contracts plummet due to the economic crisis, a number of companies have cut their spending on translation. The decline was the most pronounced in the sector of advertising, marketing and PR translation, with the market dropping by up to 60 percent. Major decline in demand was also observed for technical translations for industrial enterprises. On the contrary, the market for legal and financial translations only dropped by several percent in 2009 as the recession gave momentum to mergers, litigations, financial audits or distraints. According to Petr Kautský, Secretary of the Union of Interpreters and Translators, the effects of the crisis also hit interpreters, but not only due the economic crisis, but also due to the fall of the Government during the Czech Presidency in the Council of the EU, due to which a number of events, in which the interpreters were about to take part, were cancelled. [3]

Most firms demanding language courses ceased to offer them as benefits and started to take the price of the courses into account as a crucial factor. The price became an indicator of competitiveness. At the same time, however price reduction is related to the quality of the teachers and their willingness to work under the market-dictated conditions. Trusting the courses to unqualified teachers may thus lead to overpaying the courses due to inefficient tuition and sub-par outcomes. [4]

Companies remain to be interested in language courses and a slight growing tendency may be observed in demand, which has already been weakened by the "crisis" for some time. The clients' assignments and their demand become more sophisticated. Companies tend to demand more specialised courses – such as business English, legal, medical or economic English and minority languages such as Danish, Finnish, etc. Another novelty involves the demand for exotic languages such as Chinese, or even the Cantonese dialect of Chinese. Demand for English however continues to dominate, including that for beginners' courses. All companies that preferred price to quality eventually changed the course due to the plummeting interest and a lack of progress in skills on the part of the students. Therefore, in the future, there may be a growing tendency where the companies demanding a language course will not restrict their criteria to the mere price. [4]

The Czech market for language services is very competitive. The schools with the biggest market potential are those that offer courses for children and adults, public courses (in groups or individually) or directly for company employees focusing on specialised terminology. Moreover, they may organise, as an example, language study programmes abroad. Growing demand for cheaper education however makes this more difficult for the schools. The economic crisis had an impact even on the methods of tuition. Individual face-to-face classes, which were preferred in the past, are now being replaced with group sessions. [5]

Agencies having experts in dedicated to a number of fields of specialisation providing translations from and into all world languages and with native speakers proof-reading them have a high market potential. Companies that have a capacity for court certifications of important documents and are able to process an assignment within a short period of time will also have a considerable edge. A high quality level is guaranteed by ČSN EN ISO 9001:2001 (management system quality), ČSN EN 15038:2006 (process quality in translation agencies) and CEPRES certificates **(**Specialised provider of translation services). [6]

A number of clients use interpretation and translation services as they do not have sufficiently qualified specialists and, first and foremost, enough time for that activity. The agencies must comply with a number of conditions so as to render it cost-efficient for the clients to order the service via their channel and for the translator to works for them. [4]

4. Analysis of a specific part of the investigation

Any marketing research has to be based on a certain approach to (concept of) the given phenomenon. As regards this particular investigation, this involves the processing of a **part of the outcome, which seeks to analyse the significance level** of the attributes factoring in the selection of a language service provider.

It was a specific aim of the questionnaire survey described by the present paper to establish the factors in the selection of an external language service provider. The company had the opportunity to express the importance level on a scale (definitely important, rather important, rather unimportant, definitely unimportant).

Attributes assessed by the respondents:

- price of the services,
- quality of the services,
- range of services offered,
- conduct and attitude on the part of the supplier's representative,
- bid quality and background documentation to the selection procedure,
- references,
- compliance with the deadlines,

- delivery terms,
- supplier availability (number of stone branches),
- office hours,
- specialised terminology,
- size of the supplier,
- length of the supplier's presence in the market,
- supplier's marketing campaigns.

4.1 Evaluation of importance factors

Table 1 summarises the importance attributed to each aspect. The "Definitely important" and "Rather important" responses are regarded as "**Important",** while the "Rather unimportant" and "Definitely unimportant" responses are rated as "**Unimportant**".

Tab. 1 Analysis of factors in selecting a language service provider as ordinal and nominal variables

Aspect	Important	Unimportant	Statistically significant difference	p-value
Quality	388	2	Yes	$2.2x10^{-16}$
Compliance with deadlines	383	4	Yes	$2.2x10^{-16}$
Price	374	16	Yes	$2.2x10^{-16}$
Delivery terms	373	11	Yes	$2.2x10^{-16}$
Conduct by the representative	363	26	Yes	$2.2x10^{-16}$
References	331	56	Yes	$2.2x10^{-16}$
Specialised terminology	329	52	Yes	$2.2x10^{-16}$
Bid quality	308	69	Yes	$2.2x10^{-16}$
Range of services	270	119	Yes	$1.9x10^{-14}$
Office hours	179	204	No	0.201
Stone branches	140	243	Yes	$1.4x10^{-7}$
Length of presence in the market	131	252	Yes	$6.3x10^{-9}$
Marketing campaigns	78	305	Yes	$2.2x10^{-16}$
Size	67	316	Yes	$2.2x10^{-16}$

Source: internal documents

A statistically significant difference was reported for all aspects with the exception of the "Office Hours". The "Number of stone branches", "Years of presence in the market" and "Size" aspects were rated as unimportant. All the other aspects were identified as important.

The following analysis (see Table 2) analyses the individual factors in selecting a translation service provider as cardinal (numerical) variables. Under the present analysis, “Definitely important=1", "Rather important"=2, "Rather unimportant"=3 and "Definitely unimportant"=4.

Tab. 2 Analysis of factors in selecting a language service provider as cardinal variables

Factor	*n*	$\overline{x}$	$\overline{x} - t \cdot \frac{s}{\sqrt{n}}$	$\overline{x} - t \cdot \frac{s}{\sqrt{n}}$	Median	sd
Quality	390	1.118	1.084	1.152	1	0.338
Compliance with deadlines	387	1.186	1.145	1.228	1	0.415
Delivery terms	384	1.312	1.258	1.367	1	0.542
Price	389	1.532	1.475	1.589	1	0.572
Specialised terminology	381	1.659	1.58	1.737	1	0.777
Conduct by the representative	389	1.589	1.525	1.652	2	0.638
References	387	1.804	1.734	1.873	2	0.692
Bid quality	377	1.828	1.745	1.91	2	0.812
Range of services	389	2.082	2.005	2.16	2	0.779
Office hours	383	2.548	2.459	2.637	3	0.885
Stone branches	383	2.731	2.645	2.817	3	0.852
Length of presence in the market	383	2.794	2.714	2.873	3	0.791
Size	383	3.094	3.022	3.166	3	0.714
Marketing campaigns	383	3.097	3.018	3.175	3	0.782

Source: internal documents

The analysis confirmed the earlier conclusions, namely that of the factors given, "Stone branches“, "Size", "Length of market presence" and "Marketing campaigns" are unimportant (with the mean value being statistically significantly lower than 2.5), that the companies do not have a clear-cut opinion of the "Office hours" and (the situation is fifty-fifty, with the mean value of 2.5), while the remaining factors are important to the companies (the mean value being 1.5 – 2] or even of key importance (with the mean value below 1.5).

Also, the analysis shows the variance in assessing the importance of the individual factors. The relatively constant values obtained for the unimportant and important factors in the assessment imply diverse evaluations. On the contrary, for the key factors, the evaluation tends to be uniform around the mean value, which is attested to by the abrupt drop in variance. This phenomenon essentially reveals that "while most factors are important to one and unimportant to another, the key factors are definitely important almost for all".

4.2 Evaluation of the mutual dependency of the factors

Table 3 further summarises the analysis of the factors' correlation matrix. As the precondition of data normality is heavily disturbed, the non-parametrical Spearman correlation coefficient is used for the analysis. The analysis worked with those questionnaires only where all the questions were filled in. 364 data sets were available.

Tab. 3 Correlation analysis of the relations

Correlation matrix of factors														
	Price	Quality	Range of services	Conduct by the representative	Bid quality	References	Compliance with deadlines	Delivery terms	Stone branches	Office hours	Specialised terminology	Size	Length of presence in the market	Marketing campaigns
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
F1	XXX	0.07	-0.04	-0.04	0.01	-0.01	-0.03	-0.03	0.09	0.09	-0.09	-0.01	0.04	0.02
F2	0.07	XXX	*0.26*	*0.13*	0.10	0.02	*0.13*	0.04	0.06	0.06	*0.13*	0.09	*0.14*	0.05
F3	-0.04	*0.26*	XXX	*0.38*	*0.29*	0.09	*0.13*	*0.16*	*0.19*	*0.25*	*0.22*	*0.28*	*0.21*	0.27
F4	-0.04	*0.13*	*0.38*	XXX	*0.30*	0.10	*0.22*	*0.21*	*0.14*	*0.20*	*0.12*	*0.10*	0.09	0.15
F5	0.01	0.10	*0.29*	*0.30*	XXX	*0.17*	*0.17*	*0.13*	*0.27*	*0.22*	*0.16*	*0.20*	*0.19*	*0.24*
F6	-0.01	0.02	0.09	0.10	*0.17*	XXX	*0.19*	*0.13*	*0.21*	*0.22*	*0.14*	*0.24*	*0.27*	*0.19*
F7	-0.03	*0.13*	*0.13*	*0.22*	*0.17*	*0.19*	XXX	*0.55*	*0.11*	*0.14*	*0.15*	0.03	0.00	0.00
F8	-0.03	0.04	*0.16*	*0.21*	*0.13*	*0.13*	*0.55*	XXX	*0.16*	*0.15*	*0.23*	0.06	0.02	0.02
F9	0.09	0.06	*0.19*	*0.14*	*0.27*	*0.21*	*0.11*	*0.16*	XXX	*0.65*	*0.12*	*0.36*	*0.26*	*0.32*
F10	0.09	0.06	*0.25*	*0.20*	*0.22*	*0.22*	*0.14*	*0.15*	*0.65*	XXX	*0.12*	*0.37*	*0.19*	*0.27*
F11	-0.09	*0.13*	*0.22*	*0.12*	*0.16*	*0.14*	*0.15*	*0.23*	*0.12*	*0.12*	XXX	*0.11*	*0.11*	0.03
F12	-0.01	0.09	*0.28*	*0.10*	*0.20*	*0.24*	0.03	0.06	*0.36*	*0.37*	*0.11*	XXX	*0.59*	*0.58*
F13	0.04	*0.14*	*0.21*	0.09	*0.19*	*0.27*	0.00	0.02	*0.26*	*0.19*	*0.11*	*0.59*	XXX	*0.55*
F14	0.02	0.05	*0.27*	*0.15*	*0.24*	*0.19*	0.00	0.02	*0.32*	*0.27*	0.03	*0.58*	*0.55*	XXX

Source: internal documents

The critical Spearman correlation coefficient (1) value at n≥30 may be determined as:

$$\rho = \frac{\sum_i (x_i - \overline{x}) \cdot (y_i - \overline{y})}{\sqrt{\sum_i (x_i - \overline{x})^2 \cdot \sum_i (y_i - \overline{y})^2}}. \quad (1)$$

Therefore, for *n*=364, the value is 0.1028. All correlation coefficients higher than this value are statistically significant and imply that there could be a linear relation.

As shown in the correlation matrix, the factors are strongly interrelated. It may also be seen that the price and quality practically do not correlate with any (price) or with a minimum number of other factors (quality). This implies that regardless of how the companies respond to the other factors, it has no impact on their response to these two. This again confirms the conclusions of the previous chapters.

Conclusion

It may be stated based on the investigation completed that the key factors regarded as the most important by companies in selecting a language service supplier are quality, price, compliance with deadlines and specialised terminology. On the contrary, size of the supplier, the length of their presence in the market, marketing campaigns and supplier availability expressed as the number of stone branch offices are regarded as unimportant. These results confirmed the contention implied by the trends in the domain of language education. The trends were analysed via secondary data collection and using studies and reviews of papers relating to the very issue.

Conclusions implied by the presented part of the investigation:

- it is intriguing that a relatively large proportion of big companies (500-999 employees) identified price as a relatively unimportant criterion – 16 %,
- quality is a dominating criterion across the companies, with smaller companies (up to 20 employees) attributing a slightly smaller importance to it,
- the importance rating for the conduct and attitude on the part of the supplier's representative drops as a function of the size of the company--the highest importance rating is recorded for small companies, for companies having more than 1000 it is also regarded as unimportant in part,
- the bigger the company, the higher the need for references,
- the issue of delivery terms is considered less important than the actual compliance with the agreed-upon deadlines,
- especially big companies (with over 1000 employees) regarded the factor of a network of stone branches to be entirely unimportant,
- the size of the supplier is a very poorly appreciated attribute especially with companies having up to 500 employees,
- the bigger the company, the more emphasis on supplier's tradition, yet the percentage of firms for which this attribute is entirely unimportant is strikingly high,
- marketing campaigns do not tend to be regarded as important yet generally, the respondents seldom admit being affected by marketing communications if they ever realise it.

The following conclusions were also formulated under the investigation. Special attention needs to be given to English, German and Russian in order to focus on the companies intending to increase their spending on language services compared to the past. The most frequent translation and interpretation assignments involve contracts and business meetings, respectively. Service quality and compliance with the agreed-upon deadlines are the factors that may be regarded more highly by the customers than the price of the service. While offering their services, it is recommended that the companies not focus on their history but rather submit to the customer recent references by other satisfied customers and reinforce quality, delivery terms and the capacity to adhere to them. The most prospective companies come from the sector of industry and services. The price is a crucial factor and as such needs to be addressed flexibly depending on specific customers; its sensitivity is a function of the company's size. Especially for smaller companies, an emphasis needs to be placed on a pro-active approach to customers by the company representative (speech, response flexibility, personal relations, ...).

The project implementation made it possible to obtain relevant information on the language services market (language education, translation and interpreting), on its existing developments and the prognosis in the future as a background to a more precise definition of future business strategies and the applicant's reinforced market position.

The findings obtained from the investigation generate indispensable sources of explicit data required for the future development of companies in the field of language education.

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Sustainable Growth of a Company by Means of Value Stream Mapping

Abstract

The world has already changed from a time when industry could sell everything it produced to an affluent society where material needs are routinely met. We are now unable to sell our products unless we think ourselves into the very hearts of our customers; each of whom has different concepts, tastes and preferences. Discussions on how to reach the comparative advantage in the global competition are constantly being lead in many workplaces and offices. After World War II, it is the Toyota Production System /TPS/ under the name of One-Piece-Flow /OPF/, that contributed most to the topic.

„Flow whenever you can, pull if you must and never push" [9] are the famous words of Taiichi Ohno, the father of Lean Production Concept /LPC/ at Toyota. The paper brings into interconnection the concept of Value Stream Mapping /VSM/, as a lean management method creating value for the customer and the technique of OPF, watching the flows of material and information. An example of the successful application of VSM at Hartmann – Rico, a.s. (Brno, the Czech Republic), a subsidiary of the transnational concern Paul Hartmann AG (Heidenheim, Germany), is given. The proposal for transition from a "Current-State value Stream Map" to a "Future-State Value Stream Map" is being outlined in the chapter "Seven Questions to make your value stream lean". In order to secure process sustainability an "Implementation Plan" has been worked out formulating a series of recommendations such as the installation of multipurpose hot melt lamination device or integration of the folding unit for the table cover drape prior to set assembly resulting in reduction of the lead time by 3.7 days.

Key Words

competitive advantage, one piece flow, value stream mapping, waste, customer tact time

JEL Classification: L23, M 11,O31

Introduction

The need to secure the life time success for a company works well as a unifying driver for all its stakeholders. When dealing with customer's satisfaction the competitive advantage becomes a key success factor. It also becomes a main driver for creating innovations and added value for the customer. The critical point is how to reveal such a key advantage of the company. And even more important how to master its application. The value stream mapping /VSM/ provides a tool to make a sustainable progress in the war against muda (waste) and gives a practical example how to implement the

principles of Lean Production Concept /LPC/ in the daily business securing thus a competitive advantage for a company in a long run [1,2].

1. All you need to know about Lean in one sentence

Analyzing the working process from the customer's point of view, whenever there is a product, there is a value stream. The two types of activities can be found in ever process, as shown in Fig. 1

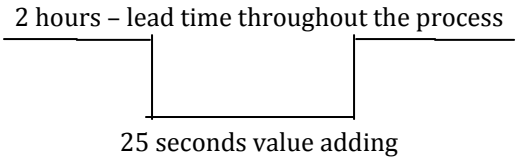
- Waste – the needless movement that must be eliminated immediately.
- Value Adding Work – two types are non-value-added and value-added work

Fig. 1 "Value adding is as big as a stone in the plum", Taiichi Ohno

Source: own

The goal of any workplace optimization is to reduce waste and increase value for the customer. The VA – Index, could serve the purpose, as illustrated in Fig. 2 and Eq.1 [7].

Fig. 2 Lead time vs. value adding time



Source: own

$$VA = \frac{\text{Value Adding Time}}{\text{Lead Time}}. \quad (1)$$

Looking for flexible, "lean" and cash generating systems in production, Taiichi Ohno, father of lean production in Toyota, realized that the key to increased productivity rests in continuous effort for absolute elimination of wasting [5, 11, 12].

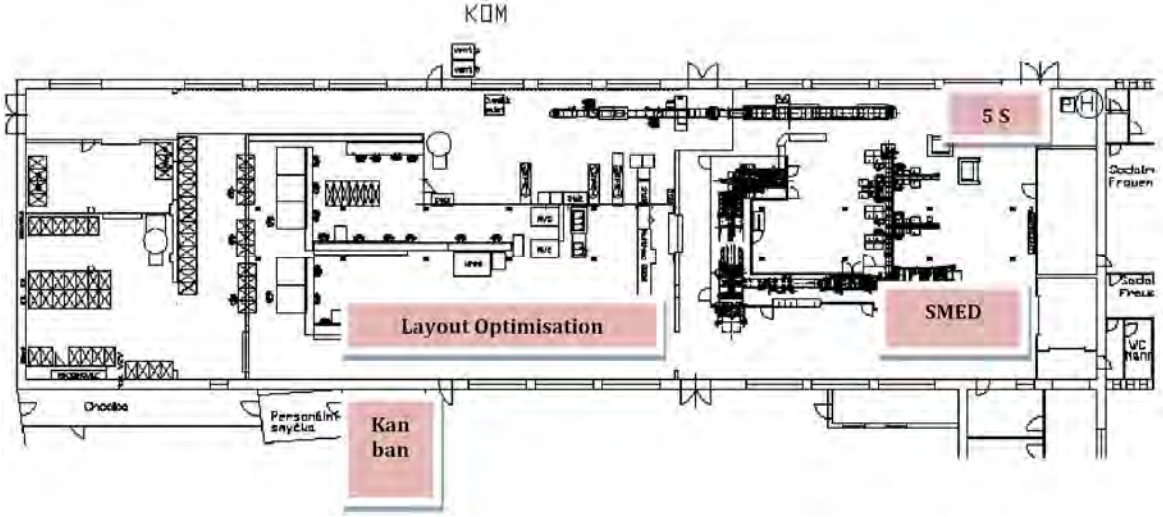
There are many definitions of Lean, the most adequate are:

- "All we are doing is looking at the time line", said Taiichi Ohno, "from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-added wastes" [9].
- Lean is maximizing flow ← by eliminating waste ← through continuous improvement ← based on the observation.
- Lean is in two words: FLOW, WASTE
- Lean in one word: FLOW [4]

2. Mechanism for Creating the Value for the Customer and Managing Door-to-Door Continuous Flow

Familiarizing itself with application of the LPC, the management of the company selects a method that he believes to be the most appropriate, taking into consideration the nature of the issue to be solved. Typically the set of lean techniques such as 5S, Poka Yoke, Kanban, 5Why, SMED (Single Minute Exchange of the Die), are of the first choice [3]. As illustrated in Fig. 3, these cost-cutting initiatives are carried out locally in single work cells and improve partial malfunctions, such as backorders, reworks, high scrap, within the process. These initiatives are mostly isolated victories over muda which fail to improve the whole and do not last long.

Fig. 3 Local Application of Lean Techniques within the Company



Source: own

Taking a value stream perspective means working on the big picture, not just individual processes; and improving the whole, not just optimizing the parts, as illustrated in Fig. 4. VSM has to be seen as a change management process securing long-term growth of an enterprise by means of changing its philosophy. Such an approach reports to yield even double-digit increases of the indicators in view annually [2, 8]. Value stream mapping is a pencil and paper tool that helps you to see and understand your door-to-door flow of material and information as a product makes its way through the value stream. In this the VSM helps you to see more than waste; it helps you to see the sources of waste in your value stream.

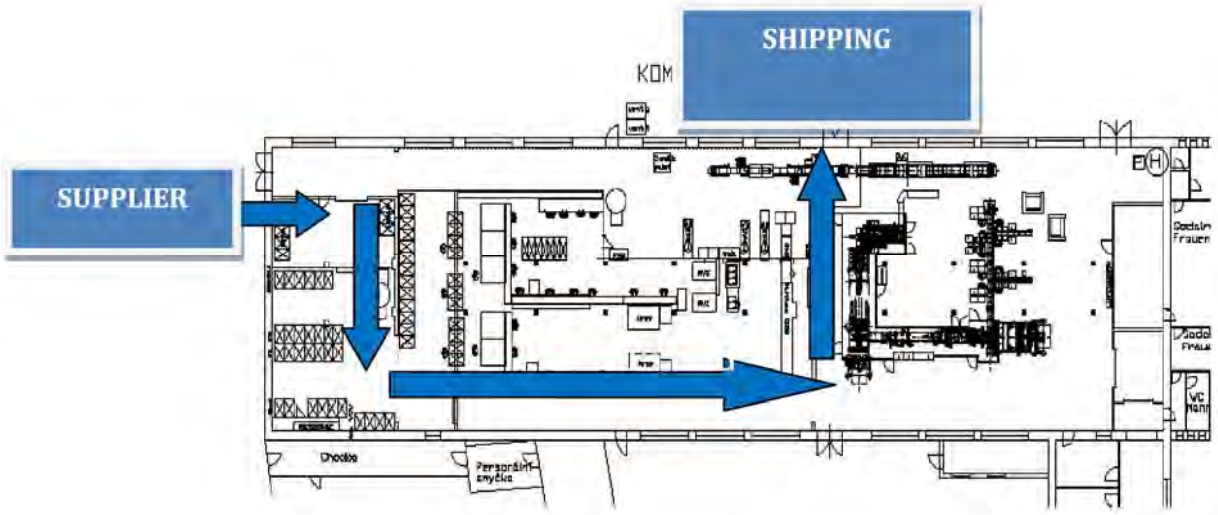
The main principles of the VSM are [7]:

- maximizing the value of the product for the customer in each and every production process. It means that "producing unneeded goods or providing wrong services in a right way means wasting";
- defining and recognizing the stream of adding value to the product by all participants of the process (from a manufacturer of raw materials to a consumer) on

the basis of analyzing existing processes and detecting sources of wasting by means of "photographs" of the real situation at the enterprise;

- creating the flow (a continuous movement of the product) along technological processes (shifting from the batch work to a continuous flow), i.e. a consecutive advance of the product without stops and inventories.. Operations that add value are identified and those that do not contribute to the value creation are eliminated;
- "pulling" the product by the client, meaning an ability of the manufacturer to design and produce goods that the consumer really needs in the "customer tact time";
- improving production organization for all parties interested, suggesting more precise definition of the value, increasing the speed of the flow (decreasing technological and production cycles).

Fig. 4 A Door-to-Door Value-Creating Perspective



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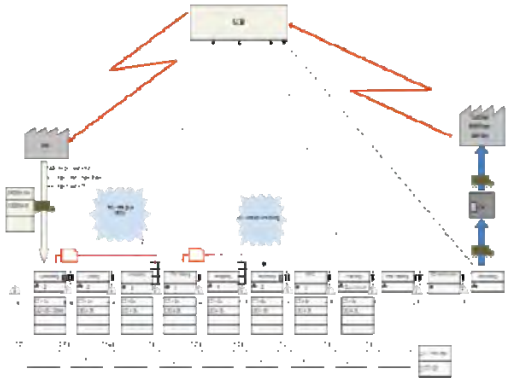
2.1 Current – State Map

The first thing when starting to draw a Current-State Map is to pick up the product family; so the map does not comprise everything that goes through the shop floor. The product or product family should be "typical" one (the runner) and it should be produced on the day, the VSM plans to be carried out. VSM means walking and drawing in pencil all the process steps (material and information) for one product family from door to door yourself.

The example of the Current-State Map for the Drape No. 463945 at Hartmann-Rico, a.s. is given in Fig. 5. The customer tact time, cycle time, change over time, idle time and number of employees are scrutinized at each process step. By means of simple icons the flow of the material and information in the process chain is illustrated. This approach puts forward the total "speed" of the product (lead time) within the process rather than the individual efficiency of the particular machine.

The observation results in calculating the VA – Index = 0, 0063 %, as given by equation (1). As a result of this value stream mapping, it has been identified that the component is being actively processed only 26 seconds out of total 4.8 days spent in the whole process stream.

Fig. 5 The Current – State Value Stream Map



Note: Not intended to be read; but to be understood as the flow of material and information.

Source: own

2.2 Seven Questions to make your Value Stream Lean

The point of getting lean is not the "mapping", which is just a technique. Important is to implement a value-adding flow. Any kind of interruption to flow means waste. Removing it your get the flow, and the process will work better ! [4] As flow and waste are defined as most important elements in the value creating process, you must keep your eyes on the Flow of: a) components and finished goods; b) people; c) information and Waste . The Overproduction is the most significant source of waste, which means producing more, sooner or faster than required by the next process. Once the product has been defined, take a short walk with senior management team and try to answer the following questions:

1. "What are the business issues with this product?" [6]

   - Quality ? ……. Cost ? .....Delivery > Volume or Mix ?
   - Process ? …… Product ? ……. Management ?

   Start at Shipping and walk backwards up the line in order to fix issues closest to the customer. The flow of information from the customer to the Shiping is important. How do Shipping KNOW what to load on the next truck? Does the information comes directly from the customer, MRP or does assembly have a link to customers and pushes the goods to the shipment ? What is the customer tact time ?
2. "Where is the pacemaker process, triggered by these customer orders?"
   In order to set the process right it is important to understand where the pacemaker is. Look for a late operation that produces exactly what the customer wants and then start pulling upstream operations.
   In one-piece-flow operations (e.g., a JIT), the pacemaker may actually be in the

customer plant. Or the signal may be thrown to the raw store and the picking process becomes the pacemaker and everything else flows right through.

3. "How capable, available, adequate, and waste free are assembly and its upstream activities?"
   At assembly / upstream you should see visible (NOT on PC) measures of
   - Quality (rework, scrap)
   - Downtime (change-overs, breakdowns, maintenance)
   - Rate (an hourly board, shop floor meetings)

   Stand and watch the line
   - Do parts flow straight from one operation to the next?
   - Does it operate at a steady rate? Do you feel rythm?
   - Are the Operators adding value or watching?
   - Are parts made the same way every time?
   - Do they have unnecessary stocks of components?
   - Watch how long it takes to fix the issue.

4. "How are orders transmitted up the value stream from the pacemaker process?"
   The key question is how the product is made. Is it made to order or is there kanban system installed ? What are the lot sizes? How often the changeovers take place. Is leveling (volume, production mix) installed ?
5. “How are materials supplied to the assembly and fabrication processes?"
   Can you see Material Flowing?
   - Ideal is typically every 30 minutes for major components
   - If you see a fork-lift truck they are probably not lean!

   Are components just deliver or do they replace what has been used?
   - Milk run or special delivery?

   Is material movement a standardized operation or do you see logistics people taking single boxes, etc.?
6. "How are materials obtained from upstream suppliers?"
   How are they scheduled?
   - By a Pull signal to replace what has been used?
   - By schedules from the MRP system?
   - By panic phone calls?

   Where do they deliver?
   - To a consignment stock? (= they’re not lean)
   - To the receiving dock?
   - To a specific area in the receiving dock?
   - Direct to the line?

   How often do major suppliers deliver?
   - Daily? Weekly? Whenever?

7. "How are employees trained in lean procedures and motivated to apply them?" [12]
   You should have seen this whilst walking around

   - Current and Future state Value Stream Maps with visible, dated, planned workshops

- Hourly Boards with visible action plans
- Workshop and Project displays
- Operators who can answer your questions

2.3 Future-State Map

The first step in VSM is drawing the current state map, which is done by gathering information on the shop floor. But the current state without the future state is not much use. The Future-State Map is most important [10]. Future-state ideas will come up as the current-state is drawn and the "Seven Questions" have been raised. It shows the ideal process with no constraints in the business, as shown in Fig. 6.

Fig. 6 To create a value-adding flow you need a "vision".

Note: Not intended to be read; but to be understood as the flow of material and information.

Source: own

It typically comprises period of 5 – 10 years ahead. Within this all bottlenecks, issues and "root causes" must be eliminated. These items are marked on the Future-State Map with the kaizen lightning burst icons. The process map in Fig. 6 resulted in door-to-door VA-Index = 0.023 % with total cycle time of 22 seconds and the total lead time of 1.1 day. Although the total cycle time could not be substantially shortened, compared to the current state, the total lead time was cut down by 3.7 days. This could be reached by :

1. Reducing of waste (waiting) at the lamination line. The former water based glue was replaced by the application of hot melt technology enabling to reduce the former waiting time for aging the glue.
2. Elimination of the process step of folding the drape. The drape folding will take place at the upstream operation.

Further benefits from implementation of VSM could be reached:

- Pacemaker process operating consistently to the customer tact time
- Increased number of inventory turns
- Faster response to problems (problem solving spirit)
- Reduction of needed space in the shop floor
- Simplification of production planning

The shorter the production lead time, the shorter the time between paying for raw materials and getting paid for product made from those materials.

2.4 Road Map

The Future-State map is usually followed by the more detailed "Implementation Plan" or Road Map which demonstrates concrete activities for the coming 6 – 12 months. Compared to the Future-State map, the complexity of the implementation plan is reduced and more straightforward. All planed activities are additionally summed up in the so called Issue Log to define measureable goals, check points, deadlines and responsibilities for the issues to be fixed. An example of the issue log is given at the Fig.7

Fig. 7 Implementation Plan for the coming 6-12 months

ISSUE LOG

No.	Date	Issue	Resp.	Deadline	Status	Remark
1						
2						
3						

Source: own

Conclusion

In order to increase competitive advantage of the company, the management of Hartmann – Rico, a.s. formed changes to the strategy on the basis of the one-piece flow principles. The aim of implementing the value stream mapping was to eliminate negative influence of wasting and thus increase the value for the customer.

Considering a specific practical example, local objectives for a particular stage of the technological process was formulated. For instance, at Hartmann – Rico, a.s. this objective included:

- analysis of processes on the laminating line, drying unit, folding line, assembly line and packaging line ;
- identification of "bottlenecks" on the basis of value stream mapping, i.e. processes or production stages where wasting occurs;
- analysis of sources of wasting;
- analysis of the production lines from the ergonomic perspective;
- analysis of processes of transporting goods and information;
- development and implementation of solutions for eliminating negative influence on the production process.

Within realization of the cost-cutting strategy at the enterprise a set of recommendations was formulated, advising the use of equipment with flexible readjustment. For example, installation of hot melt lamination system and integrating

folding of the table cover drape into the upstream process, prior to the set assembly, reduced the wasting of 3.7 days within the overall process time.

Implementation of the organizational innovations that we have formulated lead to the improvements in the material and information flows within the Lean Production Concept at the enterprise. Particularly, these suggestions were connected with developing measures for reducing waiting, rational use of production personnel, organizing more ergonomic production layouts and reducing time wasting for the service staff during change-over and maintenance.

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New Management Systems and Their Application Through ERP Systems in the Czech Republic

Abstract

In today's competitive environment, in which the changes are more and more turbulent, it is important to evaluate continuously company goals, strategy, individual processes and ways of performance measurement. To maintain the competitiveness companies have to observe their environment and flexibly react to its changes. It is not sufficient to evaluate past performance of a company but it is necessary to determine planned values and specify ways of achievement and measurement of these values. Currently, traditional methods of measuring company performance are widely used but they are not sufficient because they do not allow a conclusive analysis of causal relationships. Therefore, it is necessary to involve new methods and models that assess the company performance not only from the quantitative, but also the qualitative perspective. For this purpose, new or modified Enterprise Resource Planning (ERP) systems are used. The main aim of this article is to analyse if companies use particular methods of performance measurement and if so, which methods. The subsidiary objective consists in finding differences between various types of companies. First part provides a short summary of theoretical aspects of company performance measurement, including some definitions of the term performance. After that, a short description of the role of the Enterprise Resource Planning (ERP) systems in the environment of a company is given. The main part of this article is focused on the presentation of selected topics examined with the help of a survey. The survey took place in January and February 2013 in companies located in the Czech Republic. The vast majority of analyzed companies were located in the Central and North-East part of Bohemia. The research team received one hundred of completed questionnaires.

Key Words

competitiveness, ERP systems, financial management, implementation of ERP systems, innovation of performance measurement

JEL Classification: L25, M11

Introduction

In today's global world when the markets are more connected than ever before the information about the financial position and performance of companies is becoming more important. If the capital providers want to choose into which company they should invest their resources, they need to compare the contemporary financial position and performance of selected companies and try to forecast their future development. [8], [18] In present economic conditions, management has to set up the criteria of

performance measurement. [16] The concept of company value management is becoming a new paradigm. From the accounting perspective, a company is successful if it generates profit. This view is, however, in terms of the theory of value management insufficient. According to Neumaierová [11], it is necessary to achieve such a profit that the return on equity exceeds alternative cost of equity. In other words, the main goal of the vast majority of companies is to maximize their market value. This strategic objective could be accomplished with the help of the strategic planning which enables an optimal use of company's resources and assures the market success of the company. [2]

To secure competitiveness and future development the companies have to adapt to the external environment. The faster the reaction is the better results the company achieves. Therefore, flexible strategy and performance measurement is getting more important for securing of the future existence of a company. This could be achieved with the help of financial management which should set up strategic goals, strategy and ways of performance measurement. These goals should be both quantitative and qualitative. The classical performance measurement is not sufficient because it is based on historical data. [6]

To enable effective financial management of the company, business information systems are continuously improved. These information systems provide the management of the company with required information which are necessary for right decision making and successful management of the company. For this purpose, new or modified Enterprise Resource Planning (ERP) systems are used. These systems enable a faster reaction to the current situation of the company as well as changes in its environment. New management system will be understood in the following text as systems, which include, for example BSC, MBO, TQM. These systems are used abroad for many years, but in the Czech Republic has been the gradual and increasing use.

1. Methodology

The methodology of the paper is based on literature overview. For the purpose of this article an electronic survey was created that took place in January and February 2013 in companies located in the Czech Republic. The vast majority of analyzed companies were located in the Central and North-East part of Bohemia. The research team received one hundred of completed questionnaires.

The survey consisted of 3 main parts: first part contained basic information about a business entity, second part was focused on usage of Enterprise Resource Planning systems in these companies and the last part analyzed financial management. The main goal of the survey was to monitor present situation in practical usage of performance measurement systems, mainly with focus on innovated approaches of strategic management. The survey was prepared in the electronic form and it contained 44 questions. To obtain relevant information about the analyzed companies both closed and opened questions were used.

On the basis of obtained questionnaires an analysis was made. The input data were processed with the help of spreadsheet application Excel. Results of each of the questions were published as a percentage share of particular responses of all analyzed companies. In this paper, only selected topics are mentioned.

2. Performance measurement of the company

Company performance is a term that is currently used very often but its definition is not clearly established. The purpose of the company performance measurement and evaluation is to assess the status of a company. This is important for a proper decision making of owners and successful management of the company in the future. Performance is usually associated with the term effectiveness which is the ability of a company to achieve specific results. On this basis, it is possible to define the company performance as an ability of a company to increase the value of money invested in it. One of the most commonly used definitions of the performance measurement stated Neely et al. [10] as follows: "the performance measurement is a process of quantifying the efficiency and effectiveness of past actions". Solař a Bartoš [14] define performance as a measure of achieving results by individuals, groups, organizations and its processes. According to Neumaierová and Neumaier [12], company performance is generally associated with the increase of the market value. Effective use of equity and debt should maximize the market value of the company over a longer period of time. This should be associated with the creation of profit or at least establishing the conditions to generate profits in the future. The above mentioned definitions suggest that the enterprise should use both own and foreign sources as efficiently as possible.

When measuring the company performance, its purpose must be defined. In other words, the users of the obtained information have to be specified. Owners, managers, creditors, banks, investment companies, financial authorities or rating agencies require different types of information. [17] Equally important is the time aspect of the performance measurement. The company performance could be measured for past as well as current periods or the measurement process could be focused rather on the anticipated future development. The size of a company plays an important role in the performance measurement. Small companies usually do not define their goals and therefore it is difficult to use a system that would define performance. [5]

The criteria measuring the company performance are based both on theoretical knowledge and practical usage. Looking into the history of the development of performance measurement ratios the development and changes in the opinions of different period are visible. Since the middle of 1970s the traditional approach to performance measurement was strongly criticized because those ratios were primarily focused on the analysis and evaluation of recent financial results. By using information embodied in financial statements of the company as the input data for financial ratios the accounting system, according to which these financial statements were prepared, has to be taken into account. [9] This is important because there exists a strong difference between a continental European philosophy that is based on the Roman law and Anglo-Saxon approach, which applies the common law. [4]

In today's competitive environment, the management of business activities which is based only on the basis of financial criteria is insufficient. Therefore an increasing emphasis is placed on the use of non-financial criteria. In the literature the proposals of creating a system for measuring the company performance are given. These amended approaches include non-financial measures, which successfully complement the financial indicators and thus overcome the disadvantages of traditional criteria measuring the company performance. [16] The development of particular generations of ratios is summarized in table 1.

Tab. 1 The development of performance measurement ratios

Generation	First	Second	Third	Fourth	Fifth
Goal	Profit margin	Profit growth	Return on capital	Adding value for owners	Long-term strategic management
Used ratios	Return on Sales	Profit maximizing	ROA, ROE, ROI	EVA, MVA, CFROI, SVA	Maximizing of market value

Source: own elaboration according to [13, p. 14]

The first three groups may be considered as the traditional methods of measuring company performance, whereas the last two groups include modern criteria and uses the latest complex management models. [7]

3. Enterprise Resource Planning systems

The process of innovation is visible in implementation of Enterprise Resource Planning (ERP) systems in corporate environment. These systems are used for better organization and use of corporate resources to ensure better efficiency of the companies. On the other hand there is a question if the implementation of the chosen ERP system is helpful for the company because of high cost of implementation, training costs, maintenance of it and its adjustment. These systems are being used for recording of accounting transactions, effective usage information from the point of view of managerial and financial accounting, financial planning, financial analysis, higher productivity, interconnection between costumer and its supplier, reduction of redundant processes, increase profitability, streamline the follow of information in companies, availability of information on the enterprise level etc. Obtained information from these systems is useful for the vast majority of business areas such as Human Resources Management, materials management, production planning and marketing.

ERP systems are systems that are being prepared by commercial companies mainly as templates. These templates are not suitable for all enterprises as they were prepared. Due to this fact it is important to modify bought templates for company’s needs. Some parts of the system are being adjusted but the core of the system remains unchanged. It is evident that the purchased ERP systems must be adjusted in the vast majority of businesses and that they must be innovated in comparison with the older versions of the system.

Stephenson and Sages [15] state that "…each organization within an enterprise has its own requirements for an ERP. They may share the same ERP solution; however, the ERP may be designed to support the specific business need of each organization. Some organizations may have a need to view the same data. For example, a sales and customer care-focused organization may need to view the same customer profile data to access customer contact information. In comparison, a human resources-focused organization may not need to be privy to this same information." Chun-Chin, Tian-Shy and Kuo-Liang [3] presents that "…in reality, the success of an ERP system is achieved when the organization is able to better perform all its business processes and when the adopted ERP system really achieves the objectives that managers strive. That is, the development of ERP performance measurement process should establish a feedback mechanism between the desired objectives of ERP adoption and the substantial effects of ERP execution."

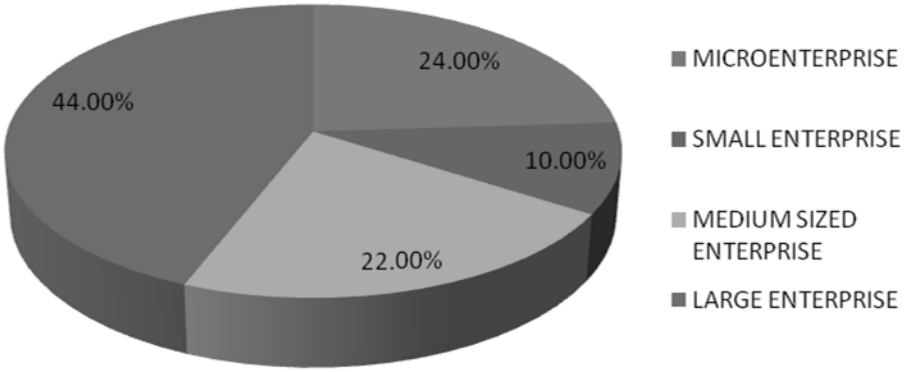
From the above definitions is evident that it is very important to choose the right ERP system that will help to improve enterprise processes optimally and ensure greatest effectiveness of corporate governance. It can be stated that companies are being more competitive due to the innovation in corporate processes and the implementation of the ERP systems on the market. [1] The most widely used ERP systems in the Czech Republic are SAP, Microsoft Dynamics NAV, Helios, K2, Orsoft, Karat, ABRA, Altus Vario and many others. Selection of the optimal information system depends mainly on company size, acquisition price of purchased ERP system, implementation costs, training costs, Return on Investment (ROI) of purchased ERP system, used ERP systems by company's suppliers and customers, current hardware equipment, business sector etc.

BSC, MBO and TQM systems are based on the monitoring of specific objectives, indicators and benchmarks. In order to track the outputs, it is necessary to obtain evidence in the form of information from different levels and departments management through ERP systems.

4. Results of the survey

The survey took place in January and February 2013 and was based on the analysis of the different businesses located in the Czech Republic. The research team received one hundred completed questionnaires from different companies. Fig. 1 presents the structure of the analyzed companies. 44.00 % of them were large enterprises, 24.00 % amounted to micro enterprises and medium sized enterprises were represented by 22.00 %. The rest of them were small enterprises with the share of 10.00 %.

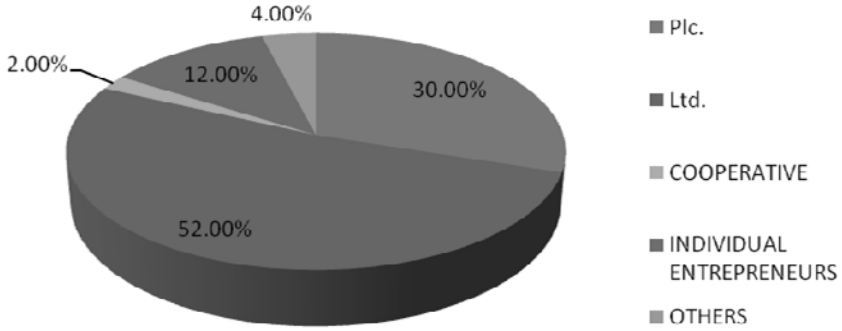
Fig. 1 The structure of the analyzed companies



Source: own elaboration

The results of the survey confirmed the general presumption that the prevailing type of a company in the Czech Republic is the limited company (Ltd.). Their share was 52.00 % of the research sample. 30.00 % of analyzed companies were public limited companies (Plc.). The third most prevalent type of a company with the share of 12.00 % was individual entrepreneurs. The rest of the analysed companies were cooperatives and other legal forms of business that can do business in the Czech Republic. All interpreted information is presented in the Fig. 2.

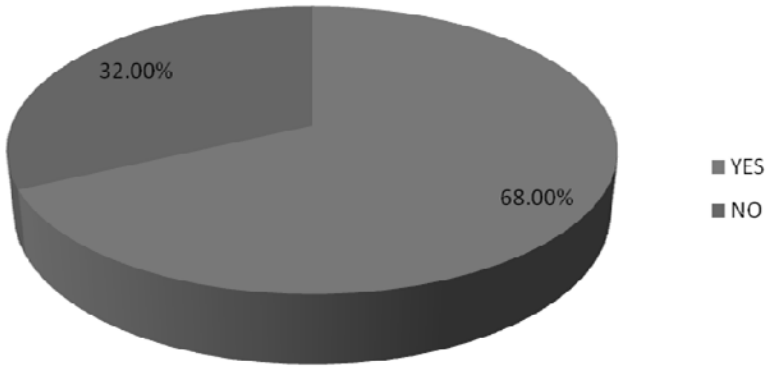
Fig. 2 Legal form of business of the analyzed companies



Source: own elaboration

One of the main question was focused on using the financial analysis within the financial management of a company. The companies were questioned if they prepare finacial analysis for management purposes annually. As it was found that 84.00 % of the companies prepare financial analysis and for the rest of companies it is not important to do it. Fig. 3 presents information about the usage of ERP system for processing financial analysis in the companies that answered positively previous question.

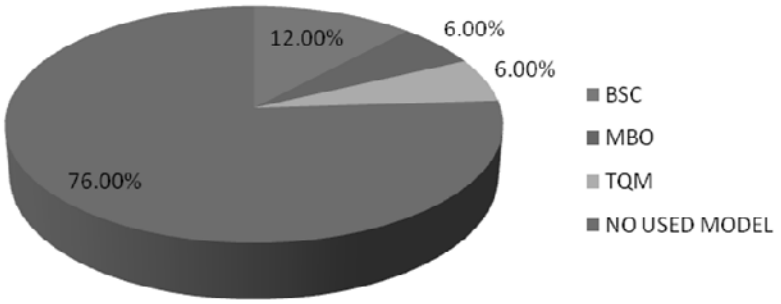
Fig. 3 Does the enterprise use ERP system for processing financial analysis?



Source: own elaboration

Based on the research, it was found that 76.00 % of analyzed companies do not use any models of strategic management for the development of the company. The most used model is the Balanced Scorecard (BSC), followed by the Management by Objectives (MBO) and the Total Quality Management (TQM) as shown in the Fig. 4. It is obvious that it could be useful if the management of a company would understand the importance of models of strategic management and their practical usage. Based on the research, it is possible to state that companies located in the Czech Republic are not interested in strategic management issues and this situation could harm their performance and competetiveness. Due to this result it could be recommendend that companies should change their approach to strategic management and inovate the processes in the company in accordance with methods that are used in developed market economies all over the world.

Fig. 4 Used models of strategic management



Source: own elaboration

Conclusion

The results of our research confirmed that companies use mainly financial analysis for performance measurement and management of the company. This result corresponds with the size of the company and its legal form because most of questioned companies were large companies such as Plc. and Ltd. These companies usually use financial analysis as a tool for financial management. Due to the criticism of traditional methods of measuring company performance, some innovations of these methods were made. In the course of time the advanced methods of company performance measurement such

as EVA or MVA were implemented in a greater extent. Lately, due to the turbulent changes in the environment of the company the usage of complex models of performance measurement such as BSC or MBO became essential. According to our survey, the complex systems of company performance measurement such as BSC use only 12.00 % of questioned companies. This result corresponds with the results of the research carried out in the Czech Republic. [16] Authors of the research are aware of that the results could be influenced by various factors. There exists a risk of misunderstanding of asked questions and therefore, the survey could give imprecise or insufficient results.

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ICT Support for Work Based Preparation to Crisis

Abstract
Information and communication technology plays an important role in the knowledge and crisis management processes, helping entrepreneurs how to learn and solve lots of different problems more effectively. Improving of the working environment by using work-based preparation is one of the main elements to be better prepared to crisis. Problem is that enterprises don't have any learning support system to recognize possible threats, provide efficient knowledge management and prepare for crisis. Crisis management is set of procedures applied in handling, containment and resolution of an emergency in planned and coordinated steps. Crisis plan has almost every company, but not everyone knows what is necessary to do at first when some crisis come. It is very important to mark out and to mind which steps are the most important. Disasters such as earthquakes or floods and others make complicated situations, but large scale of catastrophes are not the only problems that can trouble the companies. In fact, there is much more of the smaller ones, for example the fallen tree over the delivery road. Goal of this paper is to analyse and design the support system for work-based preparation for crisis. This paper describes an information system with a goal of preparing workers for potential crisis at their workplace. The preparation is important in order to avoid economical effects of crisis. The result of the research is the analysis of possible threats of crisis, design of the information system and recommendations for developing work-based learning with regard to the encouragement of efficient knowledge management in entrepreneurship.

Key Words
ICT, work-based learning, knowledge management, crisis management

JEL Classification: H12; O32; D83

Introduction

In these dynamic times, when everything changes fast, being unprepared is not an excuse. It is important to keep in mind that the faster you respond, the fewer problems you will face. The first thing to do, in getting ready for any crisis, is identifying your worst imaginations and prepare stakeholders for this kind of situations using modern information and communication technologies. Technology is a tool, body of equipment and processes, action and material, knowledge and skills which are necessary in order to achieve goals by using current resources. Problem is that entreprises don't have any learning support system to recognize possible threats, provide efficient knowledge

management and prepare for crisis. Goal of this paper is to analyse and design the support system for work-based preparation for crisis. workers sign security rules very often without actually knowing the content or how to respond when the crisis happens. Workers simply dont' know what to do, when some crisis comes – environmental disaster, factory breakdown, various accidents or even situation, when internet connection fails. This paper describes an information system with a goal of preparing workers for potential crisis at their workplace. Mr. Skrbek [1] says that society of the 21st century is increasingly exposed to various crisis, ranging from natural disasters and industrial accidents to terrorism. With that in mind we can see the importance of preparation in order to avoid economical effects of such a crisis. According to Brian Ellis [2] first 2 days of any crisis are crunch time. If managers are not ahead of the crisis by that time frame, it's likely that it will run them over. The proper preparation for the crisis should shorten these 48 hours. It is necessary to solve the crisis as fast as possible, because of the economical impact. Proper preparation in this case is using the educating information system for work-based preparation to crisis. The result of the research is the analysis of possible threats of crisis, design of the information system and recommendations for developing work-based learning with regard to the encouragement of efficient knowledge management in entrepreneurship.

1. Terms and definitions

Authors of this paper are using some specific terms. It is significant to arrange about meaning terms used through presented paper.

Information and communication technologies (ICT) stands for information and communication technology and is defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information. [3]

Work based learning (WBL) generally describes learning while a person is employed. The learning is usually based on the needs of the individual's career and employer, and can lead to nationally recognized qualifications. [4]

Knowledge management (KM) comprises a range of strategies and practices used in an organization to identify, create, represent, distribute, and enable adoption of insights and experience. [5]

Crisis management – The identification of threats to an organization and its stakeholders, and the methods used by the organization to deal with these threats. Due to the unpredictability of global events, organizations must be able to cope with the potential for drastic changes to the way they conduct business. Crisis management often requires decisions to be made within a short time frame, and often after an event has already taken place. In order to reduce uncertainty in the event of a crisis, organizations often create a crisis management plan. [6]

2. Knowledge management technologies

Knowledge starts as data – raw facts and numbers (e.g. the market value of institution's endowment). Information is data put into context. Information is readily captured in documents or in databases; even large amounts are fairly easy to retrieve using modern information technology systems. Technology is a tool, body of equipment and processes, action and material, knowledge and skills which are necessary in order to achieve goals by using current resources. There are a number of different factors interfering with the successful knowledge formation process.

Knowledge Management requires technologies to support the new strategies, processes, methods and techniques to create, disseminate, share and apply the best knowledge, anytime and anyplace. It is a systematic process that focuses on the acquisition, transfer and use of effective, topical knowledge and best practice, thus promoting sustainable operation of an organization. According to Antlova [8] knowledge is the most important resource and it is the reason, why some entrepreneurs find successful business opportunities while others do not.

Knowledge management includes acquiring or creating knowledge, transforming it into a reusable form, retaining it, and finding and reusing it. In order to find the most efficient data management technology, it is necessary to study knowledge flow methods, which will help us understand what information systems need to be used to reach the set goals.

3. Work-based preparation for organizational learning

Currently, society is facing more and more new and unexpected situations and it is necessary to react in new and innovative ways [1] . With this in mind we might to come to realize that current education system is not always the best or only solution to face the quickly changing world.

Work-based learning and knowledge management are complementary concepts which can establish the grounds for organizational learning [9]. The former is used as a tool to achieve a goal of making tacit knowledge explicit by maximizing learning opportunity and internalizing knowledge by experience at a working place. For an employee, it is an opportunity to learn and possibly obtain a higher degree, while for an employer a way to increase the power of the company thanks to better-qualified staff.

According to Wagner [10], WBL has a long history of experimentation and the educational concepts and practices described as workplace learning and WBL have a rich epistemological tradition in debates about:

- The relationship between education and the economy;
- The relation of theory and practice in education processes; and
- The dualism of education and training and associated social and institutional divisions.

With ICT constantly evolving, authors are debating about another relationship, and that is between education and technology, as learners are getting used to new technologies and expecting more flexible learning schemes. According to Bradley at al. [11], for example, well-designed e-learning programmes can offer similar benefits of flexibility and learning choice as with distance learning, but can also offer additional benefits as well.

Optimal result cannot be reached by only quantitative actions when informatizing current processes and procedures, changing the shape but leaving its old contents. The maximum gain cannot be reached by keeping the essence of current processes, but by modernizing and changing them. [12] Only innovative approach, growing employment of knowledge potential, transformation of traditional procedures, in every industry and activity using the opportunities provided by ICT. All this combined results in a new way of thinking and action. The results are qualitative changes – better prepared employees for crisis, more effective manufacturing and services.

4. Crisis management

Crisis management is set of procedures applied in handling, containment and resolution of an emergency in planned and coordinated steps. A crisis plan has almost every company, but not everyone knows what is necessary to do at first when some crisis come. It is very important to mark out and to mind which steps are the most important. With WBL employees can also be prepared to understand which processes in crisis work or don`t.

Disasters, such as earthquakes or floods, are very complicated situations, when the standard system of management or standard ways of communication, planning and controlling does not work. What can we do for preparing before some of this non-traditional position?

We can call the world in 21st century as an information society. Almost every European people need for work connection with international partners, providers, etc. Every process needs a fast reaction – in communication, analysis, actual data. Natural disasters are special type of organizational crisis in which an act of nature creates a collective crisis situation for whole communities in and across geographic regions.

Our environment has become a more crowded world and as the population increases pressures such as urbanization, the extension of human settlement, and the greater use and dependence on technology have perhaps led to an increase in disasters and crises. Greater exposure to political, economic, social and technological change in countries often removed from the bases of companies requires crises managers, to effectively deal with crises and disasters (often located a substantial distance away).

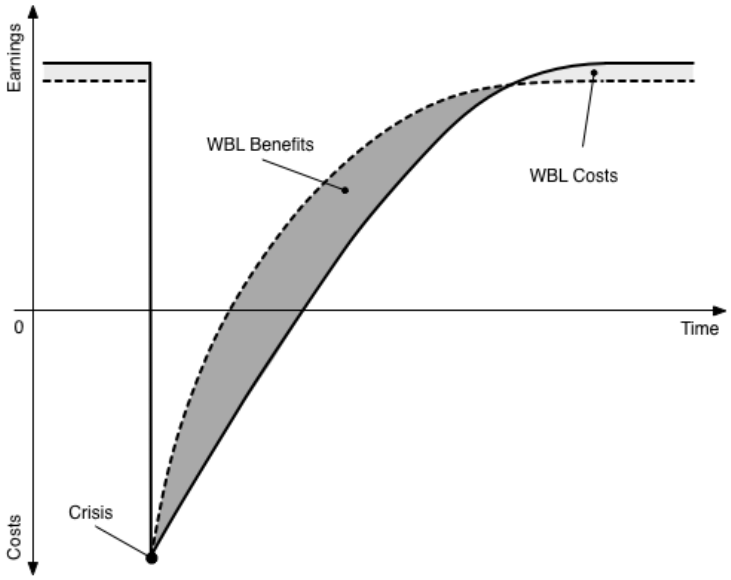
During the globalization the world is also becoming more interdependent and connected. Small-scale crises in one part of the world can have a significant impact on other parts of the world. Natural disasters, floods, earthquakes or political instability in one part of the world can dramatically reduce range of manufactured goods in other part of world. [13]

Great example is Chrastava (Czech Republic, Liberecký kraj, floods in 2010). In this area were many automotive suppliers cooperating with Germans corporations. After floods 80 % of companies were unable to respond to the demand of their customers. Employers and employees did not know what to do with this situation. This chaos situation lasted for two months and only half of all companies were able flexibly to re-start production.

If there will be some kind of learning process how to deal with natural or political crisis, it would save money, time, position and reputation of companies on the market. A crisis represents an anomaly and has the potential to change the very basis of competition. [14] Firms that have the flexibility to respond are today in advantage. They can easily redeploy critical resources and use the diversity of strategic options. Investment to the leaning, knowledge base and crises system for employers and employees has positive impact on health of the firm. As soon as some kind of this system is prepared for natural disasters, than situation can be the best practices useful for other type of crisis (for example: economical crises). [15]

Impact of implementing a WBL is illustrated in fig. 1. While every company is different with tendencies to different types of crisis its actual benefits will vary.

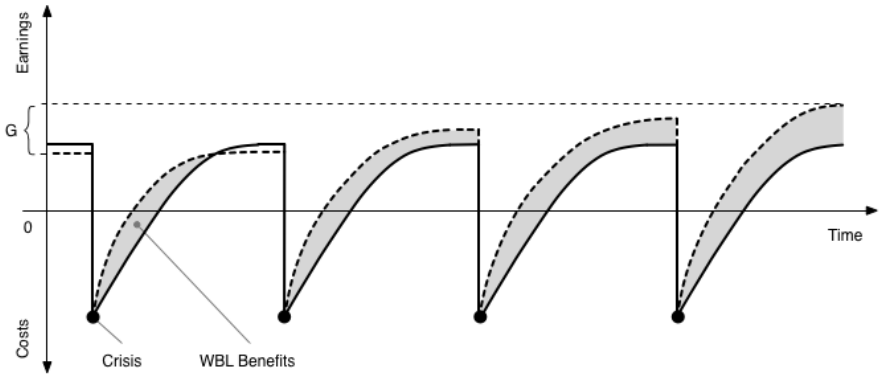
Fig. 1 Benefits of WBL after crisis



Source: Authors

Authors are considering two companies, first one is not investing in WBL (solid line), while the second one is (dashed line). In a normal situation earnings of first company are higher, but when the crisis comes the second company is handling the crisis better and the losses are lower. The difference between the companies in handling the crisis is called the WBL Benefits. We suppose that crisis occurrences repeat in time which makes benefits to increase in time. Representation of such a situation can be seen at Fig. 2, where we assume that the company that was using WBL is using its benefits to support their growth in order to increase their earnings (represented by a letter G in the picture).

Fig. 2 Benefits of WBL over time



Source: Authors

5. ICT use in development of support system

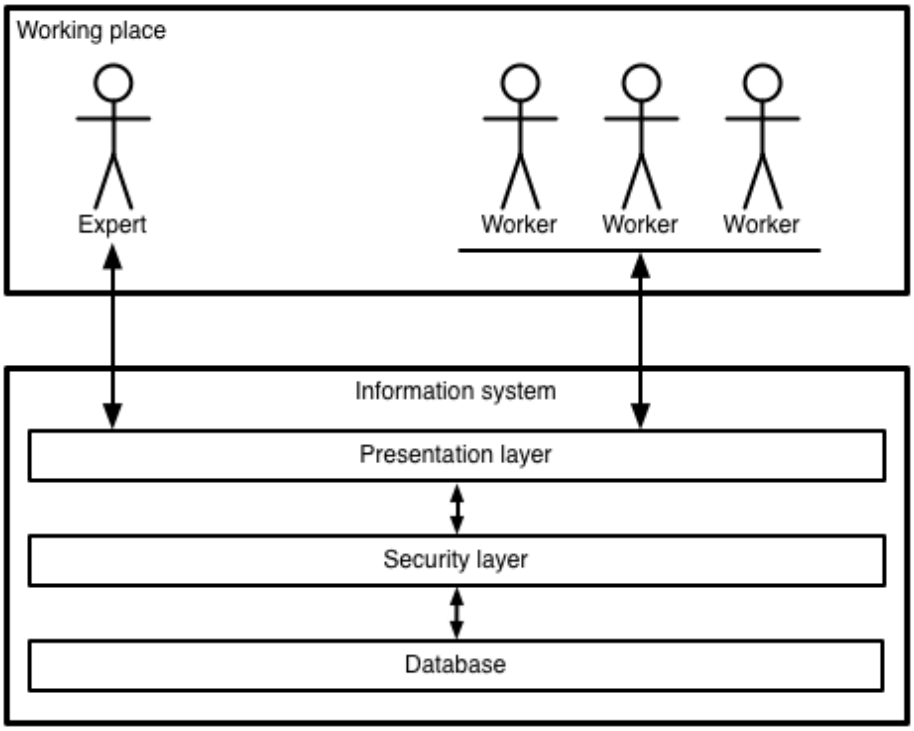
Fundamental model of the system (Fig. 3) should contain cascade of at least 3 main components that workers and experts can interact with.

Presentation layer – A great diversity can be expected among the users of this system as they are going to use different devices and therefore we have to take in account ICT like tablets or phones. With this in mind we have to develop the system to be usable on multiple types of devices. We can achieve this by responsive templates.

Security layer – Every instance of the system is going to contain lots of data that can be potential trade secret. The IS will provide security conditions to protect sensitive information.

Database – The presentation and security layers will be the same in every instance of the system. Each database is going to share some similarities. The database is going to be an individual part of the system. Company has to identify possible crisis and find solutions which will be adapted by a didactic transformation.

Fig. 3 Model of information system used for WBL



Source: Authors

Conclusions and future work

The work with knowledge implies creation of content: generation of a new knowledge in order to stimulate the development of innovative processes. The right approach would be to accommodate the learning system to the needs and desires of modern enterprises using up-to-date technologies. Work-based learning as a new concept and understanding of learning at workplace and knowledge management conceptualized as a spiral of knowledge creation by enabling the dynamic knowledge conversion process between the individual and the organization. [9]

A combination of an innovative approach, increasing use of the knowledge potential, alteration of traditional procedures in every industry and activity using the opportunities provided by ICT resulted in a new way of thinking and action. We must try even more to link today's educational stages with the environment in which it is provided.

This paper describes analysis of an improvement of crisis management with work-based learning supported by ICT. Design of the information system and recommendations for developing work-based learning with regard to the encouragement of efficient knowledge management in entrepreneurship. This study provides also a theoretical WBL model of IS for different enterprises.

The next step will be the development of a real work-based learning information system. Because it is very important to measure performance of WBL we have to develop a measuring system based, for example on games that can be integrated as part of team building events. It is also important to develop a method of didactical transformation of solutions to identified crisis.

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Risks Matrixes – Risks Assessment Tools of Small and Medium-Sized Enterprises

Abstract

The enterprises need to assess the risk dynamic of financial instability and this risk impact on small and medium-sized enterprises' development, because it is important for enterprises to extend commercial activity and to open a new structural subdivision. The authors have researched types of risks, their identification, classification and assessment possibilities in activities of small and medium-sized enterprises. The authors have used the own created algorithm of identification, classification and assessment of enterprises' risks.

The goal of the research is to study the economic and financial risks impact on small and medium-sized enterprises' development in Latvia. The authors have carried out the questionnaire of representative small and medium-sized enterprises about the economic and financial risks impact on enterprises' development in Latvia. The authors have created classification of Latvian services sectors economic and financial risks in the period from 2011 to 2012.Those risks have been included in questionnaire.

The risks matrix is a quantitative assessment tool of risks. The authors have created Latvian service sector economic and financial risks matrix. The authors have arranged risks by their size of possible losses for enterprises. For each type of risk has been assessed its probability of realization.

The authors have created Latvian accommodations (hotel) and food services technological process risks map. Several parts of the risk map (segments) make it possible to assess each type of the risk separately in its segment. Risk matrix can use to choose enterprise's strategy of risk management. Enterprise's strategy of risk management is developed by analysing zones of risk level.

Key Words

classification of risks, risks assessment, risks matrixes, questionnaire of small and medium-sized enterprises

JEL Classification: G32

Introduction

Micro, small and medium-sized enterprises in accordance with European Commission Regulation No 364/2004 characterizes maximum staff number and annual turnover (or annual balance sheet total). A medium-sized enterprise is defined as an enterprise which employs fewer than 250 persons and whose annual turnover does not exceed EUR 50 million or whose annual balance-sheet total does not exceed EUR 43 million.

In Latvia it is important for small and medium-sized enterprises to create an efficient economic activity in both – economic growth and economic slowdown. Enterprises have to assess marketing activities to attract new and retain existing clients, as well as to create marketing activities that increase client's loyalty to enterprise's brand. Decreasing income, enterprise should reconsider expenditures in order to improve financial stability of enterprise. Because of reduction in client's solvency, small and medium-sized enterprises in Latvia regularly have to make the profit and loss account, so that they operatively keep up with ratio of incomes and expenditures. Evaluating these aspects, enterprises can develop a business strategy to effectively perform their economic activities. Establishing business strategy enterprises need to classify economic and financial risks as well as assessing their impact of enterprise's development.

Assessing the risks in small and medium-sized enterprises it is appropriate to use risk matrixes and risk maps. Using the risk matrixes employees of the company can assess each risk possible losses and its probability of realization. Several parts of the risk map (segments) make it possible to assess each type of the risk separately in its segment. Assessing the zones of the risk levels small and medium-sized enterprises can create their own risk management strategies.

1. Previous research

One of the world's leading insurance broker and risk management consulting organization Aon Corporation has issued a Global Political Risk map for 2011 [2]. The risk in each country was ranked as Low, Medium-Low, Medium, Medium-High, High or Very High. Latvia is in group of countries which risk level is ranked as Medium. The major risks are the risk of monetary and the risk of reduction in client's solvency.

Henschel T. have studied German small and medium-sized enterprises' risk management problems, and carried out questionnaire for enterprises about it. Level of risk management is different in enterprises. In first variant there is risk identification and their documentation. In second variant staff of enterprise additionally are forming risk classification and risk assessment. In third variant enterprises do above mentioned two methods and additionally perform risk management systems. According to questionnaire results if you perform risk management system than size of enterprise is uppermost factor. The bigger enterprise, the detailed and completed is risk management system. According to questionnaire of German small and medium-sized enterprises results budget planning mainly was made in time period from two to three years. The most of small and medium-sized enterprises risk identification and assessment was doing once in a three months [3].

Kirova M. had studied graphical presentation of risk assessment in management decision making process [9]. Korombela A. had studied risk management problems of Polish small and medium-sized enterprises and carried out questionnaire about it. Representatives of small and medium-sized enterprises (there was fully completed 101 inquiry form) arranged risk by their importance. The most important risks were F5 –

The risk of financial instability, E7 – The risk of increasing competition and E1 – The risk of legislative changes [11].

Komkova J. had researched risk management major problems in Latvian non-financial companies. The most of enterprises doesn't have insight about the need of the risk management implementation. The practical risk management implementation is not possible without relevant risk models adaptation to Latvian economic situation. There is a lack of experience in implementation and adaptation of risk management [10]. Zimecs A. and Ketners K. had studied business solution methodologies and their impact on risk management and carried out survey of risk management developments. As shown by the survey results, the entrepreneurs, who use the risk management elements in their daily activities, mainly manage risks by using information of business results [16].

2. Questionnaire for small and medium-sized enterprises

The authors have researched economic activity of services sector enterprises in Latvia in the period from 2005 to 2011. From 2005 to 2008 total turnover indices of Latvian services sector enterprises have increased. The highest value was researched at the first quarter of 2008. From the second quarter of 2008 sector has started to decline, reaching lowest rates in 2009. From 2010 total turnover indices again started to increase.

Latvian service sector SWOT analysis is a component of the sector's risks identification and classification. By defining the opportunities and threats of the external environment and the strengths and weaknesses of internal environment, the authors have identified the risks [14]. External environment's opportunity is to increase turnover of Latvian services sector, if the country stimulates the economic growth, as well as external environment's opportunity is to choose qualified staff. Latvian services sector external environment's threat is the risk of insufficiency of credit resources, which may lead to decrease of current assets. Latvian services sector internal environment's strength is a possibility to offer assortment of qualified services, because level of staff skills has been improved. Latvian services sector internal environment's weakness is deadlines of service extended, because the risk of debtors are increased.

Based on the above mentioned the authors have created classification of Latvian services sector's economic and financial risks in the period from 2011 to 2012 (Tab.1). The authors have carried out the questionnaire for representative of small and medium-sized enterprises about the economic and financial risks impact on enterprises' development in Latvia. Those risks have been included in questionnaire.

The authors have prepared questionnaire about enterprise's activity and economic and financial risk assessment to predict possible amount of losses. The authors have carried out questionnaire where representatives of small and medium-sized enterprises gave information about economical and financial risk impact on enterprise's development in 2012. The authors sent inquiry forms to representatives of small and medium-sized enterprises and received fully completed inquiry forms from 35 representatives of small and medium-sized enterprises. 23 enterprises works in service sector (65.7 % of all

representatives who sent back fully completed inquiry form), 7 enterprises work in industry sector and 5 enterprises work in civil engineering sector.

Representatives of questionnaire had assessed economical and financial risks to predict possible amount of losses (value 5 mean maximum losses). Average results of questionnaire are showed in table (Tab.1). From enterprises which participated in questionnaire there were medium-sized enterprises (48.6 %), small enterprises (40.0 %) and micro enterprises (11.4 %).

Results of questionnaire show that small and medium-sized enterprises mainly do budget planning for period of time till three years. Budget planning does Financial Department manager in majority of small and medium-sized enterprises. Also economical and financial risks identification and assessment does Financial Department manager in majority of small and medium-sized enterprises.

Tab. 1 Classification of Latvian service sector economic and financial risks in the period from 2011 to 2012

The economic risks	Ranged by losses	The financial risks	Ranged by losses
E5 – The risk of reduction in client's solvency	3.829	F1 – The risk of unpaid credit	3.371
E2 – The risk of increment of taxes	3.657	F3 – The risk of monetary	3.314
E7 – The risk of increasing competition	3.343	F2 – The risk of increment of interest	3.286
E6 – The risk of insufficiency of credit resources	3.343	F13 – The risk of reduction in profitability of own capital	3.257
E4 – The risk of damage to reputation	3.314	F12 – The risk of reduction in profitability of assets	3.257
E3 – The risk of financial instability of suppliers	3.314	F11 – The risk of liquidity	3.229
E1 – The risk of legislative changes	3.171	F5 – The risk of financial instability	3.171
The financial risks	Ranged by losses	F6 – The risk of insufficiency of own capital	3.057
F9 – The risk of debtors	3.571	F14 – The risk of insolvency (bankruptcy)	2.914
F8 – The risk of insufficiency of current assets	3.486	F10 – The risk of reduction in circulation of stocks	2.857
F4 – The risk of inflation	3.400	F7 – The risk of investment (the new project planning)	2.829

Source: the authors have created

Questionnaire participants' assessed economical risks which were ranged by possible amount of losses (value 5 mean maximum losses) (Tab. 1). The biggest losses were possible from impact of these risks – The risk of reduction in client's solvency (E5), The risk of increment of taxes (E2) and The risk of increasing competition (E7). Questionnaire participants' assessed financial risks which were raged by possible amount of losses from them (Tab. 1). The biggest losses were possible from impact of these risks – The risk of debtors (F9), The risk of insufficiency of current assets (F8), The risk of inflation (F4), The risk of unpaid credit (F1) and The risk of monetary (F3).

3. Risks matrixes: the case of Latvian service sector

The authors have researched types of risks, their identification, classification and assessment possibilities in activities of small and medium-sized enterprises. The purpose of the first International risk management standard ISO 31000:2009 is to provide principles and generic guidelines on risk management. Risk is effect of uncertainty on objectives. Impact of risk could be negative (losses) or positive (profit). If we study negative impact of risks, than amount of risk characterizes possible amount of result (losses) and probability of realization. Process of risk assessment includes identification and classification of risk and risk analysis of quality and quantity [12]. To quantity assess individual risk level you have to use two values – possible amount of risk result (losses) and its probability of realisation. Risk level is multiplication of result of risk (losses) and its probability of realisation. Risk level can calculate by formula (1).

$$risk\ level = result\ (losses) \cdot probability\ . \quad (1)$$

For quantity assessment of risk it is possible to use risk matrixes which arrange risks by their possible amount of result (losses). According every type of risk its probability of realisation is assessed also [17]. The authors have created risk matrix where is showed different zones of risk level (Tab. 2).

Tab. 2 Example risks matrix (Different zone of risk level)

0,8 – 1,0	L	P	P	K	K
0,6 - 0,8	L	L	P	P	K
0,4 - 0,6	V	L	L	P	P
0,2 - 0,4	V	V	L	L	P
0,0 - 0,2	M	V	V	L	L
Probability of realization	Small risk	Medium risk	Big risk	Maximum acceptable risk	Critical risk
characteristics of the size of risk (losses)					

Source: the authors have created

Description of zones of risk level (Tab. 2):

- M – small risk level – small losses and probability of realization (0.0 – 0.2);
- V – medium risk level – small losses and probability of realization (0.2 – 0.6), medium losses and probability of realization (0.0 – 0.4), big losses and probability of realization (0.0 – 0.2);
- L – big risk level – small losses and (0.6 – 1.0), medium losses and (0.4 – 0.8), big losses and (0.2 – 0.6), maximum acceptable losses and (0.0 – 0.4), critical losses and (0.0 – 0.2);
- P – maximum acceptable risk level – medium losses and probability of realization (0.8 – 1.0), big losses and probability of realization (0.6 – 1.0), maximum acceptable

losses and probability of realization (0.4 – 08), critical losses and probability of realization (0.2 – 0.6);
- K – critical risk level – maximum acceptable losses and probability of realization (0.8 – 1.0), critical losses and probability of realization (0.6 – 1.0).

Risk matrix can use to choose enterprise's strategy of risk management. Enterprise's strategy of risk management is developed by analysing zones of risk level [1]:

- In zone of small risk level, medium risk level, and big risk level for enterprise is recommended to create risk management system in order to decrease identified risks, their possible amount of losses and probability of realisation;
- In zone of big risk level and maximum acceptable risk level for enterprise is recommended to realise risk insurance;
- In zone of critical risk level for enterprise is recommended business interruption.

The authors have used their own created algorithm of enterprises' risks identification, classification and assessment [7].

- Important stages of above mentioned algorithm are:
- Make the SWOT analysis of services sector;
- Get to know with the surveys of the major risks in the world;
- Create the classification and description of specific services technological process risks;
- Classify and assess risks in order to create risks matrix;
- Assess risks by using the special coefficient method;
- Rank external and internal risks by their impact on sector enterprises' development.

The small and medium-sized enterprises can use the authors created algorithms of classification and assessment of the risks to produce their own risk management systems. Enterprises carrying out their sector SWOT analysis and preparing description of technological process risks can identify and classify specific sector's economic, financial and technological process risks. For risk quantity assessment small and medium-sized enterprises can use risk matrix, which arrange risks by their possible amount of losses. According to each type of risk it is possible to assess its probability of realisation.

The authors have created economic and financial risks matrix (Tab. 3) to quantity assess economic and financial risks of Latvian service sector enterprises. The authors have arranged risks by their size of possible losses for enterprises. For each type of risk has been assessed its probability of realization. The size (losses) of the risk are divided into – low risk, medium risk, high risk, maximum acceptable risk and critical risk. Most of the authors classified Latvian service sector sizes of economic and financial risks from medium till maximum acceptable. The probability of risks realization is from 0.2 till 0.6 (Tab. 3). The maximum acceptable economic risks (with the probability of risks realization is from 0.4 till 0.6) are the risk of increment of taxes (E2) and the risk of damage to reputation (E4). The maximum acceptable financial risks (with the

probability of risks realization is from 0.4 till 0.6) are the risk of unpaid credit (F1), the risk of monetary (F3), the risk of financial instability (F5) and the risk of debtors (F9).

Tab. 3 Latvian service sector economic and financial risks matrix

0,6 - 0,8					F7				
0,4 - 0,6				E3	E1 E6 F4 F12 F10		E4 E2 F1 F5 F3 F9		
0,2 - 0,4				F13	E7 F2 F6 F11		E5 F8 F14		
Scale α_i	1	2	3	4	5	6	7	8	9	10
Probability of realization	Small risk		Medium risk		Big risk		Maximum acceptable risk		Critical risk	

Source: the authors have created

The maximum acceptable economic risks (with the probability of risks realization is from 0.2 till 0.4) is the risk of reduction in client's solvency (E5). The maximum acceptable financial risks (with the probability of risks realization is from 0.2 till 0.4) are the risk of insufficiency of current assets (F8) and the risk of insolvency (bankruptcy) (F14).

The authors have created classification of the accommodation (hotel) and food services technological process risks [7]. The authors for risk assessment have created first part of risk map (Tab. 4) where is showed accommodation (hotel) and food services technological process risks in separate segments. Accommodation (specific – hotel) services risks are marked with letter "V". Food services risks are marked with letter "D" [13].

Tab. 4 Latvian accommodations (hotel) and food services technological process risks map

					V1 V4		V5 V2			0,6 - 0,8
										0,4 - 0,6
	V3		V7		V8		V6			0,2 - 0,4
										0,1 - 0,2
10	9	8	7	6	5	4	3	2	1	Scale α_i
Critical risk		Maximum acceptable risk		Big risk		Medium risk		Small risk		Probability of realization
										0,1 - 0,2
					D6		D7 D3			0,2 - 0,4
			D2 D4		D5 D1					0,4 - 0,6
										0,6 - 0,8

Source: the authors have created

The critical technological process risk is the risk of security system (V3). The maximum acceptable technological process risks are the risk of client's payment (V7), the risk of HACCP (Hazard Analysis and Critical Control Point) system (D2) and the risk of employees' hygiene (D4). The big technological process risks are the risk of reservation (V1), the risk of ordering food services (V4), the risk of accounting (V8), the risk of choice of food assortment (D1), the risk of food preparation (D5) and the risk of food products storage (D6). The medium technological process risks are the risk of registration (V2), the risk of room service (V5), the risk of ordering additional (beauty, health, fitness) services (V6), the risk of acceptance of raw materials (D3), the risk of food products storage (D6) and the risk of client's service (D7).

Risk map of four segments is created linking both first part and second part of risk map. In the centre of risk map is point which value is the smallest and probability of risk realisation is the smallest also. Risk map which consists of four segments shows values and probability of realisation of every type of risk (Latvian service sector economical, financial risks and accommodation (hotel) and food service technological process risks). Risk matrix and risk maps are one of the most common and easiest risk assessment tools. The authors recommend using risk matrix and risk maps in order to assess different types of risks. The authors recommend for small and medium-sized enterprises to use method of risk ranking assessing external and internal risks by their effect on enterprises' development [8]. Internal and external risks effect coefficient values show which of these two risks (internal or external) has bigger impact on sector enterprises' development. For small and medium-sized enterprise's is important to regularly assess the risk of insolvency (bankruptcy) (F14) in order to perform in time arrangements to increase financial stability of enterprise.

The authors recommended using Altmana E. Model (adapted for Latvia by RTU scientists Sorins R. and Voronova I.). Test results for trade service sector enterprises show that forecasting accuracy of the risk of insolvency (bankruptcy) (F14) is more than 80 % for both models (Atmana E. Model, Sorins R. and Voronova I. Model) [4]. Jansone I. and Voronova I. have studied financial stability problems of Latvian trade sector enterprises [5]. Voronova I. have studied financial risks and possibilities to assess them, as well as financial stability models which are adapted for other countries (for circumstances of individual country) [15]. The authors have classified and assessed trade service technological process risks [6], as well as accommodation (hotel) and food services technological process risks [7]. It is important for small and medium-sized enterprises to indentify and classify specific technological process risks. Enterprises can use risk matrix to quantity assess specific type of risk (Figure 2). In order to clearly show several types of risk in small and medium-sized enterprises it is recommended to use risk maps (Tab. 4). Different types of risk are show in several segments of risk map (as far as four segments).

Conclusions

The small and medium-sized enterprises can use the authors created algorithms of classification and assessment of the risks to produce their own risk management

systems. Enterprises carrying out their sector SWOT analysis and preparing description of technological process risks can identify and classify specific sector's economic, financial and technological process risks.

For risk quantity assessment small and medium-sized enterprises can use risk matrix, which arrange risks by their possible amount of losses. According to each type of risk it is possible to assess its probability of realisation. Risk matrix can use to choose small and medium-sized enterprise's strategy of risk management. Enterprise's strategy of risk management is developed by analysing zones of risk level. Risk map which consists of four segments shows values and probability of realisation of every type of risk. Risk matrix and risk maps are one of the most common and easiest risk assessment tools. The authors have recommended small and medium-sized enterprises using risk matrix and risk maps in order to assess different types of risks.

Questionnaire participants' assessment economic risks had raged by possible amount of losses from them. The biggest losses is possible from impact of these risks – The risk of reduction in client's solvency (E5), The risk of increment of taxes (E2) and The risk of increasing competition (E7). Questionnaire participants' assessment financial risks had raged by possible amount of losses from them. The biggest losses is possible from impact of these risks – The risk of debtors (F9), The risk of insufficiency of current assets (F8), The risk of inflation (F4), The risk of unpaid credit (F1) and The risk of monetary (F3).

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The New Technologies as the Source of Competitive Advantage of Hotels

Abstract

The objective of the paper is to present the role of new technologies in gaining competitive advantage by hotels at the tourist services market. In order to meet the set research objective in-depth interviews, supported by a questionnaire survey, were held in February and March 2013. The respondents were represented by management personnel of the selected hotels functioning in Lower Silesia region. Empirical part of the paper was preceded by theoretical discussion regarding the essence and sources of competitive advantage, as well as the role of new technologies in its establishment. The obtained research results indicate that hotels implement new technologies mainly focused in the field of ICT (Information and Communications Technology) at the level of customer service, including front office. New solutions cover, in fact, all areas of hotel functioning, however, they are most frequently implemented in the area of front office, sales and marketing.

Key Words

new technology, competitive advantage, hotel

JEL Classification: L83, O33

Introduction

Contemporary challenges faced by hotels require an orientation towards thinking through the perspective of three components typical for a strategic triangle – enterprise – client – competition. The growing competition at the hotel services market imposes on hotels the need to search for competitive advantage factors. In the conditions of innovation-based economy high-tech functions as the incentive for the entire economy development since it creates added value and new jobs, stimulates investments as well as increases efficiency and profit. However, high-tech role in particular branches is diversified.

1. Competitive advantage and new technologies as the research subject

Competitive advantage represents the result of better, than other competitors (or the market leader), accumulation, development, transformation of specific resources,

capacity and knowledge configuration in order to achieve satisfactory level for meeting clients' needs. Competitive advantage of an enterprise is not of a permanent nature, it changes over time and is established based on internal and external determinants [13]. In a long-term perspective a company is capable of securing its better competitive position only as the result of continuous and ongoing construction of competitive advantage [4]. References in literature on the subject present different concepts of factors (sources) underlying competitive advantage. D. Depperu and D. Cerrato [3] distinguish: material and non-material resources, key competencies, but most of all knowledge. T. Kamińska and G. Dzwonnik, based on extensive studies of Polish enterprises indicated that the most important source of competitive advantage is the efficiency of the internal information transfer system. The lowest significance was assigned to the capacity for monitoring of both macro-environment components and the system of trainings [6]. New technologies and innovations are emphasized in the classification presented by E. Skawińska. According to this author the sources of enterprise competitive advantage take the form of: technological progress, restructuring, concentration, consolidation, acquisitions, education system, investments and innovations [12].]. Therefore new technologies are regarded as the source of an enterprise competitive advantage.

In the hereby study, and in accordance with P. Lowe's suggestion, the following definition of technology was accepted: technology is understood as equipment, methods and also theoretical knowledge, skills as well as an organization manifested by an adequate structure and systems in force [based on 8]. In literature on management the application of new technologies is presented in different aspects. Firstly, it can be analysed at two levels: strategic management and customer service referring mainly to in-room guest services and front office [7, 5]. Secondly, new technologies are applied in different functional and organizational areas of a hotel, i.e. front office, housekeeping, convention centre, food & beverage, leisure centre, reservation and marketing, accounting and personnel, as well as technical service. High-tech applied in hospitality business is also divided into six types of groups:

1. Computer, information, telecommunication technology and photo-techniques, as well as information carriers and digital devices. The core concept is to combine information technology with telecommunication and networks which are adopted in hospitality sector. It mainly refers to the Internet, Intranet, Extranet, mobile phones[1]. One of the most important aspects related to the Internet development is the introduction of an interactive contact with a client at a large scale.
2. Software (including systemic software) used in rendering hospitality services, customer service and hotel management. This type of support is extensively diversified and sophisticated in assisting information technology. Among the most important software the following may be listed:

[1] They combine many functions (e.g. a digital video-camera, a digital photo-camera, a radio, a tool for purchase-sales transactions financing), a mobile phone may be used as a multimedia projector, iPhone may serve as a door opening device and a MoodPad may be used as a remote control for hotel room equipment.

- CRM (Customer Relationship Management – represents the approach consisting in identifying and attracting customers bringing in the highest profit for e.g. a hotel, but mainly in integrating and spreading information about clients from different sources [1], e-commerce (an online system supporting company presentation and its offer sales via the Internet[1]), e-community (the system which allows for creating virtual groups of clients around an enterprise who are interested in e.g. some specific type of service), e-procurement (the system supporting all purchase transactions management by means of contracts and the choice of suppliers);
- MRP (Manufacture Resource Planning – planning resources for the service process), ERP (Enterprise Resource Planning – resource planning for the entire hotel);
- CAM (Computer Aided Manufacturing), it is not advisable to eliminate the service provider, high-tech is mainly focused on service process support;
- virtual front office – self-service check in & check out kiosks.

Subsystems are functioning within the framework of these systems which aim at supporting the services ordered and their packages, e.g. in hospitality business an electronic system of restaurant service represents a good example since it facilitates:

- electronic computer recording (e.g. taking orders);
- hotel room-service on line;
- division of main courses, starters, alcoholic and non-alcoholic beverages and assigning codes to them owing to which it is possible to prepare quickly and error free, as well as serve the ordered dishes and beverages offered by the hotel gastronomy;
- CCM – i.e. convention centre management, e.g. in hotels, which facilitates coordination of activities related to conference rooms reservations and events management, graphic control of bookings on a scheme, adjusting bookings to the existing needs, automatic calculation of booking prices, conference room management, communication with front office module by means of guest's file or booking.

3. The development of devices and technical facilities for hotel services booking, online booking platforms, e.g. HRS (Hotel Reservation System)[2], CRS (Computer Reservation System), booking.com system implementation.

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[1] Hotel chains use personalization based on customer preferences. CRS or GDS apply modern computer software allowing for the identification of guest's preferences regarding, e.g. wallpaper colour, type of music played, scent, entertainment by marking possible options on the website, i.e. the, so called, thematic cards of client needs are prepared [10].

[2] They are designed mainly for the purposes of selling services offered by a hotel and not to make the choice easier or more comfortable for a client. Among operators functioning at the European or global market the following can be listed: booking.com, Octopustravel.com, HRS.com, Venere.com, Hotelclub.net. At the domestic market the following are present: HRS.pl, Polish Travel Quo Vadis, Hotelia.pl, Visit.pl, TwojaPolska.pl, 24travels.com, Hotel.pl, Be My Guest. Cooperation with accommodation facilities is usually based on commission fees paid by hoteliers to their Internet service by a room per night sold.

4. Innovations in nutritional technologies – currently we observe a significantly higher usage of local produce, taking advantage of innovative cooking style and the original combination of flavours.
5. Progress in the area of modern materials and technology, with its source in traditional and modern industry[1], applied in hospitality sector. E.g. construction materials and technologies facilitate upgrading safety, functionality, or user's comfort, for example non-slip floor in the kitchen, dust protection coating on hotel elevation.
6. Innovative technologies in hotel management – the implementation of sustainable development concept[2], new management concepts, e.g. outsourcing, franchising, contractual management.

2. The objective and research methodology of the paper

The objective of the paper is to identify new technologies' role in gaining market competitive advantage by hotels. It was defined by means of surveys applying ordinal scales used for orderly arrangement of particular competitive advantage sources' significance. For the purposes of collecting opinions in-depth interviews, supported by a questionnaire survey, were held in February and March 2013. The respondents were represented by management personnel of the selected hotels functioning in Lower Silesia region (Wrocław, Legnica, Jelenia Góra, Szklarska Poręba, Karpacz, Świeradów-Zdrój). The spatial scope of research resulted from the position of Lower Silesia region at Polish tourism market (high ranking regarding domestic and foreign incoming tourist traffic). The research covered 20 selected three, four and five star hotels. The following arguments were in favour of such choice of research objects:

- following the observations made by the hereby paper authors, hotels of these categories are most successful at the market and represent leaders in the area of innovation implementation,
- managers of these hotels are willing and open for cooperation with scientific environment both in the sphere of didactics and participation in scientific and sector oriented conferences. They frequently represent university graduates of tourism courses,
- three star hotels are the dominant ones in the structure of Lower Silesia hotels, while in the group of four star hotels the highest dynamics in their number increase has been recorded in the last decade.

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[1] Industry sectors derive their knowledge from modern scientific disciplines, e.g. food industry and gastronomy takes advantage of achievements in genetics and biochemistry.

[2] E.g.: the sustainable development programme by Orbis S.A. Group (the largest Polish hotel group) is based on a global PLANET 21 programme announced in 2012 (in the previous year it was functioning as *Earth Guest*). It covers 21 commitments in 7 domains (nature, innovation, carbon dioxide, health, employment, dialogue, local community) to be carried out until 2015. They include among others: trainings for employees in 95% of hotels regarding the prevention of diseases, promotion of well balanced meals in 80% of entities, the usage of ecological products in 85% of hotels and also the reduction of water and energy consumption by respectively 15% and 10% in all hotels [11].

The above presented surveys should be referred to as pilot ones, aimed at the research problem exploration and the need justification for more studies to be conducted in this matter.

The empirical part of the paper was based on literature reference sources review and analysis in the area of management and referring to the essence and sources of hotels' competitive advantage as well as the role of new technologies in the process of its construction.

3. The role of new technologies in gaining competitive advantage by the selected Lower Silesian hotels – empirical studies

As it has already been mentioned, in order to define the role of new technologies in constructing competitive advantage by hotels, in-depth interviews were held in 20 hotels of Lower Silesia region. The research sample consisted only of three, four and five star hotels with the first group constituting the vast majority (85 %). All hotels were private and their prevailing organization and legal form of running a business was a limited liability company (40 %), next a natural person (20 %), civil partnership (20 %) and general partnership (15 %). One entity was owned by the joint stock company (Orbis). The surveyed hotels employed from 10 to 80 members of staff and as far as the number of rooms is concerned they represented both small entities (14 rooms) and large ones (860 rooms). About 35 % hotels reported the history of over 20 years in business, the rest represented either newly constructed entities or buildings – mostly historical ones – adapted for hospitality purposes.

Apart from one, all surveyed hotels declared that in the past five years they have introduced changes in their service provision technology. New solutions referred to sales and marketing (in case of 74 % surveyed entities implementing new technologies), technical service (74 %), front office (63 %) and the next in line were food and beverage (47 %), leisure centre (42 %) and housekeeping (21 %). In some situations the technologies introduced were complex and integrated, i.e. covered many areas (or even the entire entity) of hotel functioning at the same time (e.g. integrated hotel management systems).

The detailed analysis of new implemented technologies, by their type, indicates that the most frequently introduced solution was the system of online bookings, which refers to both, supplementing an entity's own website with an online booking engine (42 %) and placing an entity's offer in external systems and on booking portals, including the sales systems of tour operators (e.g. www.hrs.com, www.booking.com, www.hotel-systems.com), which also referred to 42 % surveyed hotels. Currently all studied entities are covered by at least one internet booking system. Two entities implemented information systems for yield management (Yield Planet), which not only helps in following an adequate price policy depending on the demand for services, but also facilitates an automatic accommodation price change in online reservation systems in

which an entity, using Yield Planet, is operating. Every third surveyed hotel has introduced integrated systems for hospitality entities management such as LSI Software or Chart. In one case such system was established specifically for the needs of a particular hotel, i.e. a large hotel (860 rooms) offering a wide spectrum of additional facilities and a complex service of the tourist segment, individual clients and corporate ones. Some hotels (21 %) updated or introduced new systems for front office service and 5 hotels, offering SPA&Wellness facilities, implemented computer systems for customer service. One hotel installed a virtual front office.

New solutions are applied, more and more frequently, in order to increase the efficiency of hotel promotion. Almost every second entity took up an effort of changing some elements in this respect. Several hotels focused on improving the already applied promotion means (reconstruction of websites), others decided to establish lasting relations (e.g. loyalty programmes, mailing, newsletter). In case of two entities new technologies were related to improving the hotel online position. For this purpose positioning was used (it allows for being placed at high position among the traditionally displayed search results by means of adequate choice and composition of key words), sponsored links (refer to displaying website addresses always before the traditional searching results by means of key words), social portals (knowledge and information dissemination about an object among participants of social portal/s) and AdWords (combined display of a particular entity advertisement by means of key words together with customer search results).

Almost all technological changes implemented in the surveyed entities referred to the application of computer technology, i.e. hardware and software, and also telecommunications for both managerial and operational activities. E.g. new central heating technology was installed in a hotel, however, it consisted not only in an exchange of heating equipment into more efficient and effective one or choosing another type of fuel supply, but in the implementation of an automatically controlled system. In case of housekeeping, following the respondents' opinions, new technologies mainly refer to information transfer rather than cleaning techniques (e.g. room status change from dirty into a clean one using a telephone in a hotel room). The similar situation refers to technical service in case of which one of the new solutions mentioned by respondents is computer control over the repair of defects. The observations made during interviews suggest that in most cases new technologies are currently associated only with ICT (Information and Communications Technology). The systems listed below are applied more and more often:

- CRM – this technology has been implemented in 32 % of the surveyed entities,
- e-commerce – 47 %
- e-community – 10 %,
- e-procurement – 10 %,
- MRP – 10 %,
- CAM – 5 %,
- online booking systems – 100 %.

These results are consistent with other studies of hospitality business which illustrate that modern technologies are associated with ICT and most frequently refer to there areas[1]: communication, booking and sales of services and also hotel management.

Among the decisive factors about company competitiveness technology is perceived as the less important source of competitive advantage (Figure 1). Its weight equals 3.8 in the scale from 1 to 5, where 1 refers to the least important factor and 5 the most important one. The respondents value to a greater extent such components as: high quality of service (4.9), online promotion and distribution (4.7), hotel location (4.5). Attention should be paid to the fact that if managers had recognized the Internet as new technology then the weight of new technologies as the factor exerting impact on competitive advantage would have been higher.

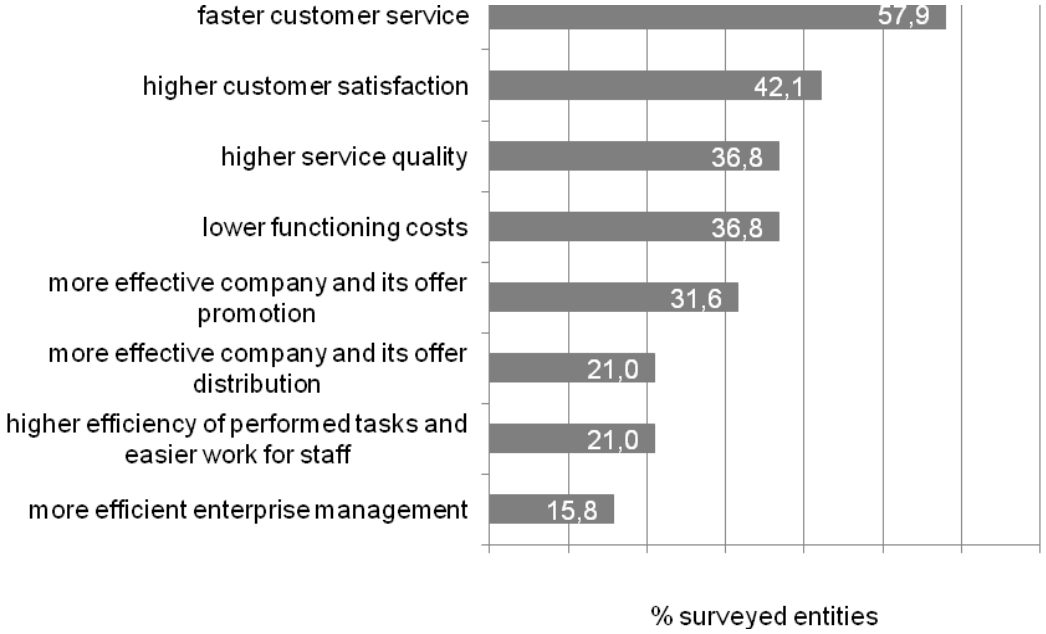
Fig. 1 The importance of factors influencing hotel competitiveness in the opinion of managers

Source: Authors' compilation.

The main reasons for new technologies implementation in the surveyed hotels are as follows: faster customer service, higher service quality and higher customer satisfaction (Figure 2), the next in line listed reasons are: lower costs of enterprise functioning and more effective company promotion. According to the respondents technological changes allow for creating competitive advantage both in the area of costs (cost leadership) and quality (quality leadership).

[1] NALAZEK, M. Nowoczesne technologie w turystyce i hotelarstwie. *Rynek Turystyczny,* 2001, **12**(13-14), pp. 12. ISSN 1230-2716.

Fig. 2 The reasons underlying new technologies implementation in the opinion of managers



Source: Authors' compilation.

Conclusions

Research results allow for giving a positive answer to the presented research problem. New technologies are, indeed, the source of competitive advantage establishment in hospitality sector, however, they do not play, according to opinions provided by the surveyed managers, the primary role. Managers claim that high level of products/services and its ongoing improvement is the most important factor. It has to be emphasized that in the conditions of knowledge-based economy it is not possible to achieve the required quality level without new technologies implementation and application, of which the respondents are not aware, since they place new technologies at one before the last position among the presented in the ranking competitive advantage sources. The respondents emphasize that in practice the crucial factor responsible for obtaining high market position is the implementation of online technologies in an offer promotion and distribution. Such opinion suggests that they do not refer to the Internet as the new technology because of its generally available and common access.

The conducted research also shows that new technologies represent the source of competitive advantage owing to: quicker service, impact on client satisfaction at higher level, upgraded service quality and hotel operating costs reduction. Additionally research results indicate that the vast majority of surveyed hotel managers (95 %) declared the implementation of some sort of changes in the period of recent five years. From the perspective of hotels' length of functioning on the market more intensive activities, in the area of new technologies implementation, are presented by hotels characterized by shorter presence on the market or these which initiated their activities

in the recent year. This observation confirms their managers' higher awareness regarding the new technologies role in competitive advantage construction. As far as hotel chains are concerned, these hotels which function within the structures of such chains present higher level of new technologies implementation and are also characterized by higher competitiveness.

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The Impact of Means of Motivation on Employee‘s Commitment to Organization in Public and Private Sectors

Abstract

Recently, both in Lithuania and abroad, the interest of practitioners and researchers in employee motivation and commitment to the organization has grown significantly. The analysis focus on impact of motivation on the employee’s commitment to organization in the public and private sectors, but the impact of motivation on employee‘s commitment to the organization in the public and private sectors is rarely compared. Yet only comparison can help to determine the reasons why the commitment of employees differs by sectors. The purpose of this paper is to establish the impact of motivation on employees’ commitment to the organization in the public and private sectors. Analysis of scientific literature was used in order to distinguish the theoretical aspects of employee motivation and organizational commitment. Questionnaire of private and public sector employees was conducted and the statistical analysis of questionnaire data led to the evaluation of the impact of employees’ motivation on commitment to the organization in the public and private sectors.

The results of this paper are consistent with the analysis of previous studies, which showed that an increased organizational commitment is noticeable in the private sector. In the public sector the means of motivation often include gratitude, recognition, good relations with colleagues, and in the private companies – the premium for the achievement of organization's goal, leisure events, and gratitude. The means of motivation have different effects on employees’ commitment to the organization. In the public sector compared to the private, relies on immaterial motivation means, i.e. rarer pay raises, encouragement premiums, which are inconsistent with the needs of employees. Whether the target of the means of motivation is an individual or a team, it has no effect on organizational commitment.

Key Words

means of motivation, commitment to organization, employee, public sector, private sector

JEL Classification: M12, M19, M54

Introduction

Employees’ motivation and commitment to organization building is regarded as one of the most important factors influencing the organization's competitiveness and

efficiency. Every organization, in order to stay competitive in the market, should care for employee motivation, promotion of their commitment, hoping to reduce staff turnover, sick time and increase productivity. Companies that do not take into account the importance of employees' motivation and commitment to the organization, are more susceptible to high staff turnover, and with today's intense competition and declining economic growth may be forced to reduce or even give up their positions in the market.

In order to clarify the links between motivation and commitment to the organization, the public and private sector perspective was chosen, as employees in the civil and private sectors have different motives [18]. This suggests that organizations apply different means of motivation, and there are differences in organizational commitment – more noticeable in the private sector, because of the motivational differences depending on the sector.

In this paper the detailed analysis of differences between the public and private sectors in the means of employee motivation and employee commitment levels and empirical study is presented.

1. The means of employee motivation in public and private sectors

Lately, there is a lot of discussion [1], [14], [17], [22], about the use of complex of employee motivation means, and a practical approach to it is becoming more and more relevant. It is generally recognized that employee motivation depends on the individual, the conditions and the time; it is not constant and always changing. Because of this complexity it is not possible to unambiguously define the best way to motivate employees. Each new approach extends the understanding of motivation and allows expanding the means of employee motivation. This forces to look for new solutions, to mobilize internal resources, to change the traditional labor and management techniques with new and more advanced ones.

The analysis of the scientific literature revealed that various authors suggest different classification of means of motivation. Recent scientific publications [6], [8], [20] on activation measures tend to look more deeply and closely link the means of motivation with organization's maturity levels and career stage features, while other authors tend to separate the material and immaterial, or in other words, the psychological, means of motivation [14], [9]. This classification is quite convenient, because the material means are actually tangible and can be expressed in monetary terms; this type of means are divided into monetary and non-monetary. Psychological means have psychological effects which are difficult to measure in term of money. It is noted that the means of motivation may be directed to the individual or the team.

In order to encourage employees' productivity, more and more research on work motivation is carried out in the world every year. In Lithuania the interest in characteristics of work motivation is growing, the analysis of what may affect the goals and motives of employees to work is performed [17], [5]. State servants' motivation in

the scientific literature is often viewed through the public and private sector perspective. It is often stated that the state service and private sector workers have different motives [18]. This fact was revealed in 2007 with the conducted representative survey of public employees, which provided an opportunity to further analyze the motivational aspects of Lithuanian state servants. A number of studies conducted worldwide revealed that the motivation of state servants is directly related to the quality and productivity of the person's activities [11]. Even ancient thinkers were interested in what motivates people to work in public service. Hints of this can be found in Aristotle, Plato and other writers' works [11]. Although a number of authors (Downs, Mosher, Chapman) have tried to answer the question what motivates state service workers, but this was only done in last decades of the past century [11].

Many researchers, who compared the researches carried out in the public and private sectors [5], [17], [24], concluded that the salary as the final purpose of work activity and life is less important in the public sector. The aforementioned authors also state that work in the public sector ensured greater job security and a variety of social guarantees. According to J. Palidauskaitė [17], the public sector compared to the private, is less frequently reformed, reorganized or goes bankrupt and it gives its employees a sense of desired stability. The public sector slowly responds to the changes in the environment, often adjusts to the political changes, environmental needs; all these factors make the public sector more stable [13], [15]. Meanwhile, in the private sector job security is highly dependent on the demand and supply in the labor market, the person's qualifications and ability to compete, the company's personnel policy, leadership style. According E. Wright and K. Christensen [1], it is easier to dismiss an employee in the private sector, while the number of legal legislation makes the dismissal of employees in the public sector more difficult. It is noticed that the objectives in public sector are not quantitatively defined, they are qualitative by nature, which determines the specifics of work [17]. The context of political activity, social control, and greater media attention conditions the actions of state servants.

In the private sector decisions are made according to market principles, rational calculation, and their impact and the extent is not as important as that of the decisions taken by the public sector. It is necessary to mention that rationality is also important in the public sector, because the public interest, equity, legitimacy, transparency and justice must be taken into account. Another important aspect is the variety, which is not as common in the public sector, as the sector's activities are regulated by legislation, administrative procedures, rules and other regulations.

The analysis of detailed means of motivation in the public and private sectors is presented in Table 1. It is noted that the motivation trends observed in Lithuanian state service in recent years is not unique in the context of other countries. Many Western countries faced the problem of selecting and keeping individuals in the public service, as well as shortages of certain specialists in the public sector. The transition of skilled workers from the public to the private sector is often caused by higher wages, better working conditions, more interesting work, greater freedom of activity opportunities [24]. Although when choosing a profession one often prefers to work in the public sector, a number of promising young professionals consider a job in state service only as

a preparation for a career in the private sector. Work experience in the public service can be seen as a certain candidate's advantage [17].

Tab. 1 The analysis of means of motivation in public and private sectors

Means of motivation	Importance of these means in	
	Public sector	**Private sector**
The assessment system	Rigid; regulated by the law; lacking objectivity	Flexible; but rarely applied
Safety and comfort of workplace	Irrelevant; not a significant mean of motivation	Relevant
Payment for the tasks performed	Does not motivate; sometimes offends	Motivating
Money, premium	Not the most important mean of motivation; salary is paid on time, premiums determined by law	An important mean of motivation, often black money
The raise of salary	Relevant	Relevant
The opportunity to serve the public interest	Motivating; relevant	Does not motivate; irrelevant
Social security	Less important	Very important
Flexible work schedule	Impossible	Relevant; motivating
Formation of informal environment	Relevant and motivating; but restricted by laws, must follow the rules and regulations	Relevant; possible and motivating
Professional development	Motivating; regulated by laws	Motivating, but depends on the organization's resources; or not possible
Relationships between staff, working climate	Formal; not enough attention is paid to the formation of informal relationships	Informal; building the positive relationship acts as an important mean of motivation
Additional income potential	Restricted by law	Possible and motivating
Variation of work (tasks)	The activities are regulated therefore hardly possible, but highly motivating	More freedom for interpretation; the work is often enriched with a variety of tasks, often changing activities; motivating
Understanding and recognition of work significance	Relevant, motivating	Motivating
Appointment of high-level tasks	Motivating	Motivating
Group work	Possible if the functions coincide; motivating	Motivating; depends on the type of work
Opportunities for self-expression	Relevant; motivating, but restricted by law	Motivating
Objectives	The objectives are social, well-designed to properly and efficiently provide services; motivating	Economic – the profit; the higher the profit, the more motivating

Source: composed by the author on the basis of [2], [22]

In summary, the motivation profile of civil servants is different from the one of private sector workforce. It is emphasized that in public sector employees' work is influenced more by internal motivators, i.e. the work itself, responsibility for implementing and influencing public policy, general concern for public affairs, while in the private sector

external motivators have more influence. The various social guarantees (pension funds, health insurance, compulsory social insurance, etc.) are important for employees in private sector. These means are less relevant to public sector employees, whose motivation depends on personal characteristics rather than on the public sector specifics or their duties: these people are opting for the civil service.

2. Commitment to organization in public and private sectors

Organizational commitment is very important because it helps to reduce employees turnover, increase employee‘s productivity and quality of work [23]. According to S. Su, K. Baird and B. Blair [19], employees with a higher level of organizational commitment, will pay more attention and put more effort in the organization, thus increasing its efficiency. The studies consistently reveal a strong negative relation between organizational commitment and turnover of staff in the organization, i.e. it is unlikely that employees, feeling a greater commitment to the organization, would intend to change it for the other organization [12], [16]. S. Su, K. Baird and B. Blair [19] found that committed employees feel a greater loyalty to the organization and are more willing to accept organizational changes, such as the installation of new technology or business internationalization. Given the high costs associated with the leasing and training of staff, increase of their productivity and effective selection of mean of motivation, organizations should pay more attention to the organizational commitment of employees, which is one of the tools helping to reduce staff turnover in the organization.

It is noted that committed employees ensure not only a high level of productivity and efficiency, but also help the organization to successfully compete in the labor market, where good and loyal employee is a special asset [4]. Committed staff must have a strong belief in the organization's mission, goals, desire to try to implement them, and the intention to work in the organization for a long period of time. In other words, it a commitment to the organization, employee‘s objectives identification with the objectives of the organization and self-sacrifice in the name of them, loyalty to the organization during crucial times, the work not only for the salary, positive atmosphere at work and so on. Research shows that in 85 % of organizations the motivation of employees tend to drop during the first six months of employment, and then further decline over time. Most employees start their work motivated, lack of motivation and the relation with the organization, i.e. commitment to it, begins to weaken over time.

It can be stated that high organizational commitment refers to employees' willingness to work on behalf of the organization, but the continuity of it depends on the responsive organization's commitment to its members: workers provide their skills because they have the best conditions designed in the organization [3]. However, in modern organizations the highly valued staff competence and inter-relations, ensuring effective co-operation, can only be achieved through long-term employee commitment to the organization.

According to S. Lyons, L. Duxbury, C. Higgins [13] and Y. Markovits, A. Davis, D. Fay and R. Van Dick [15] employees in private sector feel greater organizational commitment,

compared to the public; this is because the private sector is more flexible and able to quickly adapt to changing environmental conditions, while the public sector is regulated by different government rules and regulations. The authors also note that the public sector's objectives are too broad and vague, which encourages focusing on the process rather than the result. It also reduces employees' organizational commitment. It is noted that the majority of public sector employees treat their commitment as a concrete commitment to a specific organizational unit, rather than whole organization to which it belongs. Private sector offers its employees attractive professional development opportunities [15], greater freedom to choose and make decisions [7] than in the public sector, which is characterized by the dominant bureaucracy. The main objective of private sector is profit-making, while for the public – to meet the needs of society, so it is likely that organizational commitment in these sectors will also be different because of the different objectives [5].

Comparing employee commitment to the organization in the aspect of the sector, it was noted that private sector employees feel greater organizational commitment, compared to the public sector; this is because the private sector is characterized by flexibility, the concrete objectives, more attractive professional development opportunities and freedom of decision-making.

3. The research scheme

Given the purpose of this study and the availability of information, a list of subjects is based on non-stochastic "targeted" sampling. The group formed to include persons with the most typical character of the study. The employees in Kaunas city public and private institutions who agreed to answer the questions were chosen as the most convenient target. Given the size of the population, a representative sample size was calculated according to the Paniotto formula.

Although this selection of individuals does not represent the population of all public and private institutions, but it is appropriate for a descriptive study. For this purpose 198 questionnaires were distributed in two companies, 169 questionnaires were returned (86 private and 83 public institutions) and analyzed. The study was conducted during April – May, 2012. The data analysis was performed using SPSS 15.0 (Statistics Package for Social Sciences) software package. This software package was used to calculate Spearmen correlation coefficient between motivation and commitment of the organization, Chi square test was used to examine the strength of commitment to the organization through means of motivation.

4. The research results

According to respondents, private institution usually applied intangible means of motivation, such as the assistance of direct executive to his/her subordinates, attention, information on how to improve the performance, correct errors. The second most

frequently mentioned mean applied in private institutions is the possibility of feel and become a member of a team, good relationships with colleagues and managers, gratitude, praise. The research suggests that employees are given the opportunity to pursue a career, can participate in discussions on important issues and decisions. The research results lead to a conclusion that private sector employees are opting for this sector because of the opportunities for self-realization, salary is a less pronounced aspect.

In summary, it can be said that the management of private institution is more concerned about the wellbeing of employees at work, organizational culture development, motivation of staff – both in word and applicable means. Communication, staff cohesion, team work is promoted. In the public institutions staff is appreciated and motivated less. Organizational commitment is conditioned by the means of motivation. To verify this connection, the hypothesis H1 was raised: different means of motivation of employees in the public and private sectors influences the difference in the commitment to the organization. Separate cases were analyzed. Material and intangible means of motivation, the frequency of their application and responses were compared by the type of institution – a public and a private company. Two tests were performed for hypotheses about the equality of means of two populations. In the first case it was analyzed whether the premiums for achievement of the organization‘s goals are more likely to be paid to public or private company employees (material measures tested). It was examined whether there is a statistically significant relationship between the premium payment and the type of organization.

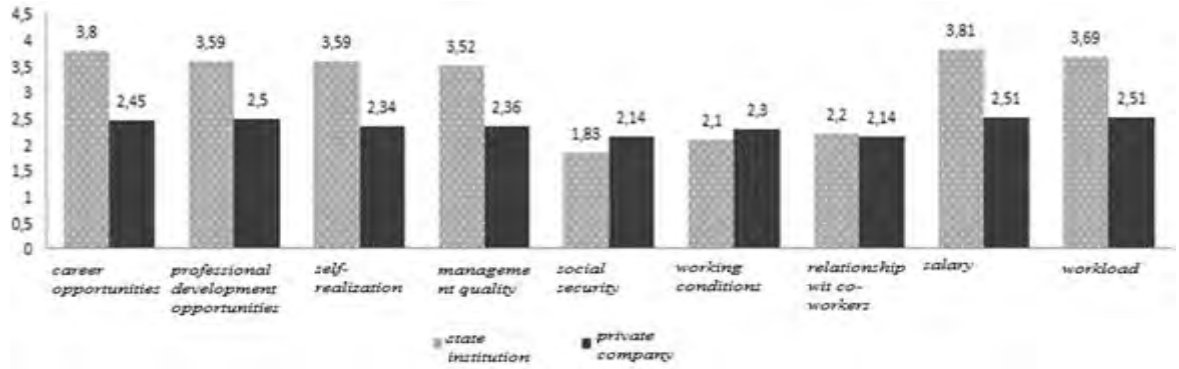
Based on the Chi-quare test, Pearson and likelihood ratio formulas, there is statistically significant relation ($p = 0.000$, $\alpha = 0.05$, $P < \alpha$) between workplace and "premium for the achievement of organization goal" as a mean of motivation. The study showed that there is a statistically significant relationship (strength determined using the Cramer's V coefficient, which is equal to 0.618) between the respondent's employer (public or private) and the applied material means – premiums for achieved results. As noted in the first question, the more frequently a private firm applies premiums for achieved results, the stronger employees’ organizational commitment is. According to E.Camilleri and B.Heijden [3], and R.Johnson, C.Chang, L.Yang [10] bureaucracy, centralized decision-making system, influencing the less flexible employee motivation system, dominates in the public sector. Employees are motivated less frequently with increasing salaries, which negatively affects the activities of state servants and reduce their organization commitment, compared with the private sector.

To find out how application of intangible means and their frequency varies depending on the respondents’ organization, the intangible mean of motivation – gratitude, praise – was chosen. A significant statistical relation between workplace and personnel motivation by verbal gratitude. Since $p < \alpha$., it means that there is statistically significant, moderate relationship (strength determined using the Cramer's V coefficient, which is equal to 0.403) between the respondent's workplace and applied intangible mean – verbal gratitude.

Thus, the raised H1 hypothesis is confirmed: really, different means of motivation in public and private sectors affect the different employees' commitment to the organization. Organizations which apply material means, especially salary, premiums for performance and so on, achieve higher motivation and encourage staff commitment to the organization. This is also revealed by the empirical investigation level of the effect of employees' motivation on commitment of the organization in the public and private sectors. As stated, the private sector is flexible, quickly adapts to changing environmental conditions, while the public sector is controlled by various government laws [13], [15]. A private sector offers its employees attractive professional development opportunities [15], there is a greater freedom to choose and make decisions [7] than in the public sector, which is characterized by the dominant bureaucracy [21].

Knowing the respondents' attitude to the means of motivation applied in their organization, it was relevant to examine the strength of their commitment. Respondents were asked to indicate how satisfied they are with the aspects of their work presented in Figure 1.

Fig. 1 Respondents' satisfaction with job aspects by the type of organization, N=169



Note: The statements are ranked as follows: 1 – completely satisfied, 2 – satisfied, 3 – I cannot say 4 – dissatisfied, 5 – completely dissatisfied

Source: authors' calculation

Notable trends of satisfaction in a private company are: the most expressed satisfaction is with social security and relations with colleagues, the least expressed – salary and workload. Thus, employee aspiration in a private company is the proper workload and salary ratio. In this difficult economic period, the reduction of salaries is noted both in public and private sectors. Respondents' satisfaction with salary is influenced by external environmental factors. Most state institutions employees assessed the job aspects with almost no difference, but it should be noted that in state institutions employees are the most dissatisfied with poor career opportunities, lower salaries and high workload. It can be stated that salary is the main mean of motivation for employees in state institutions, as mentioned earlier by the respondents. This is a source for living, which is significantly different from other motives. It can be stated that work for salary reduces the work motivation and commitment to the organization and it's pursued objectives in the long run. For civil servants the objective is to serve the public and help

people. The lack of proper motivation means that government institution employees lose the desire to try and achieve the expected results.

Conclusion

1. The study revealed that the means of employee motivation and commitment are different because of the specifics of the public and private sectors. The private sector is more flexible and able to quickly adapt to changing environmental conditions, while the public – controlled by various government regulations. The public sector's objectives are too broad and vague, and it complicates the promotion of organizational commitment.
2. The employees' commitment to the organization is usually subject to different means of motivation in public and private sectors. Less flexible employee motivation system is in the public sector. Private sector offers more attractive professional development opportunities to its employees. The study revealed that the means of motivation applied in the private sector are more consistent with employees' preferences compared to the public sector. These reasons result in the higher level of commitment to the organization in private sector.
3. The means of motivation preferred by the employees of governmental institutions are almost the same, therefore it is necessary to switch to a more flexible motivation system in the public sector. This system should be based on the best examples from the private sector, focused on employees'' preferred means of motivation, and adapted to the public sector under the existing opportunities.

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Evaluation of Czech NUTS 2 Competitiveness Using AHP and Group Decision Making

Abstract

The contribution solves the problem of alternative access towards evaluating of competitiveness of NUTS 2 regions in the Czech Republic. In the absence of mainstream views on the assessment of competitiveness, there is sample room for the presentation of individual approaches to its evaluation. The basic aim of the contribution is due to the method of analytic hierarchy process (AHP) and aggregation of individual priorities to define the position of NUTS 2 regions in closed programming period of 2000 – 2006 years. The sense of applying the method will be setting the order of NUTS 2 regions reflecting their competitiveness reached for the year, based on selected criteria, which are employment rate, gross domestic product, gross domestic expenditures on research and development, gross fixed capital formation, knowledge intensive services, net disposable income and patents indicators. We can obtain the idea of mutual competitive position of these regions by applying the method. The analytic hierarchy process is a concrete method for multicriteria decision making which uses pair-wise comparison matrices to calculate weights (priorities) of given objects (criteria or alternatives to be evaluated). These individually determined priorities will be aggregated into group priority vector which will serve as basis for further computations of our problem. The macro-regional indicators are chosen based on expert estimation regarding to accessibility of relevant statistic data. Based on the application of the method we can gain detailed view on regional competitiveness of regions by way of quantitative characteristics which can lead to more precise definition of reached competitiveness of NUTS 2 regional units in the European Union.

Key Words

competitiveness, macroeconomic indicator, pair-wise comparison, AHP, aggregation

JEL Classification: C61, D79, 018, P25, R11

Introduction

The competitiveness has become quite a common term used in many professional and non-specialized publications. Nevertheless, evaluation of the competitiveness issue is not less complicated. Effectively analysed competitiveness means to be based on a defined concept of competitiveness. For evaluation of regional competitiveness, we face the problem of the basic concept and definition of competitiveness due to absence of a consistent approach of its definition. In the absence of mainstream views on the assessment of competitiveness, there is sample room for the presentation of individual approaches to its evaluation. In our paper we will examine the possibility of evaluation

the competitiveness of the regions of the Czech Republic at NUTS 2 level in terms of analytic hierarchy process [1] using group decision making. The level of NUTS 2 regions for evaluation of competitiveness seems to be legitimate especially because of the fact that European Commission accents the level of regional units from aims of economic and social cohesion view and realization of structural aid in the EU member states. When making concept of suitable evaluation tools of national [11] and regional competitiveness it is necessary to suggest not only difficult but also simple methods which enable quick evaluation of competitiveness by accessible tools. Database for our paper has been taken from OECD Regional Statistics – eLibrary system. Paper analysis includes last programming period (from 2000 to 2006) of European Union – in case of the Czech Republic

1. Approaches to Competitiveness Evaluation

Evaluation of competitiveness in terms of differences between countries and regions should be measured through complex of economic, social and environmental criteria that can identify imbalanced areas that cause main disparities [4]. Creation of competitiveness evaluation system in terms of the EU is greatly complicated by heterogeneity of countries and regions and also by own approach to the original concept of competitiveness. Comparing instruments for measuring and evaluation of competitiveness in terms of the EU is not a simply matter. Evaluation of regional competitiveness is determined by the chosen territorial region level, especially in terms of the European Union through the Nomenclature of Territorial Units Statistics (NUTS) – in our paper we apply NUTS 2 level, but we can also apply different NUTS level – e.g. NUTS 3 level.

First approach based on application of specific economic coefficients of efficiency includes two methods of multi-criteria decision making. The first one is the classical *Analytic Hierarchy Process* (AHP) where relevance of criteria's significance is determined by the method of Ivanovic deviation. The second method – *FVK* is a multiplicative version of AHP [1;3]. Also *DEA* methodology was presented in case of Visegrad four regions. DEA evaluates the efficiency of regions with regard to their ability to transform inputs into outputs [5]. In other words – what results a region can achieve while spending a relatively small number of inputs (resources). This fact is vital for us to perceive the efficiency like a "mirror" of competitiveness. This aspect is also crucial in this paper, where we present AHP to gain more detailed view on competitiveness of regions by way of quantitative characteristics. Second approach is presented by EU structural indicators evaluation. These indicators are used for the assessment and the attainment of the objectives of the Lisbon Strategy. Another and also specific approach is macro econometric modelling and creation of an econometric panel data model [2].

2. Evaluation criteria

First represented entrance criteria is **rate of employment** in age group 20 – 64 years (ER). From the economic relevance rate of employment is important in accordance to

number of economic active people in above mentioned age group. Employed population consists of those persons who during the reference week did any work for pay or profit for at least one hour, or were not working but had jobs from which they were temporarily absent.

Gross domestic product (GDP) was chosen as it is one of the most important macroeconomic aggregates which is simultaneously suitable basic for competitiveness assessment of the country, but also for the regional level, where also NUTS 2 regions belong. It is obviously not always valid that with increasing level of GDP [10] (i.e. increasing efficiency of regions) also the rate of obtained competitiveness/competition advantage grows.

Gross domestic expenditures on research and development (GERD) are sources for further economic growth increasing as stimulation of basic and applied research creates big multiplication effects with long-term efficiency and presumptions for long-term economic growth in economics. R&D is defined as creative work undertaken on a systematic basis in order to increase the stock of knowledge, including human knowledge, culture and society and the use of this stock of knowledge to devise new applications.

Gross fixed capital formation (GFCF) due to international accounting is a basic part of gross capital (capital investments), in which is also the change of inventories and net acquisition of valuables included. According to ESA 95 methodology GFCF consists of the net assets acquisition minus decrease of fixed assets at residential producers during the time period plus certain increasing towards the value of non-produced assets originated as a consequence of production activity of producers or institutional units. It is estimated in purchase price including costs connected with instalment and other costs on transfer of the ownership. Fixed assets are tangible or intangible/invisible assets produced as the output from production process and are used in production process repeatedly or continuously during the one-year period. It is an index of innovating competitiveness which enables to increase production on modern technical base.

Knowledge intensive services (KIS) as % of total employment are among the fastest growing and dynamic sectors of the economy. Knowledge intensive services are characterized by high degrees of contact intensity and a high number of variants. Typical examples are professional business services like consulting, IT and marketing. Knowledge-intensive services are supplied mainly to final consumers, as public services (e.g. health) or private professional ones (consumer financial advice [9] or computer repair).

Net disposable income (NDI) is the result of current incomes [8] and expenditures, primary and secondary disposal of incomes. It explicitly excludes capital transfers, real profits and loss from possession and consequences of the events as disasters. In contrast to gross disposable income, it does not cover fixed capital consumption. Disposable income (gross or net) is the source of expenditures on final consumption cover and savings in the sectors: governmental institutions, households and non-profit institutions for households.

Patents (PAT) are a key measure of innovation output, as patent indicators reflect the inventive performance of regions. Patent indicators can serve to measure the output of R&D, its productivity, structure and the development of a specific technology/industry. Among the few available indicators of technology output, patent indicators are probably the most frequently used. Patents are often interpreted as an output indicator; however, they could also be viewed as an input indicator, as patents are used as a source of information by subsequent inventors.

3. Analytic hierarchy process

We use multicriteria decision making method called analytic hierarchy process (AHP) to evaluate competitiveness of Czech regions. This method allows including both quantitative and qualitative criteria and is used to determine priorities (weights). Pair-wise comparisons matrices which entries are results of pair-wise comparisons are characteristic for this method.

The essence of pair-wise comparison is mutual measure of all pairs of considered elements. We compare criteria among themselves or alternatives with respect to given qualitative criterion. For numerical expression of intensity of relations between compared elements Saaty created nine-point scale [7], where 1 means equality and 9 extreme difference of importance.

Data obtained through pair-wise comparisons are inserted into the pair-wise comparison matrix A, its entries are signed generally a_{ij}. An $n \times n$ (square) matrix is created, see Fig. 1.

Fig. 1 General multiplicative pair-wise comparison matrix

	element x_1	element x_2	…	element x_k
element x_1	a_{11}	a_{12}	$\cdots$	a_{1k}
element x_2	a_{21}	a_{22}	$\cdots$	a_{2k}
$\vdots$	$\vdots$	$\vdots$	$\ddots$	$\vdots$
element x_k	a_{k1}	a_{k2}	$\cdots$	a_{kk}

Entries of the pair-wise comparison matrix represent *estimation of weight ratio* of two compared elements, i.e. of criteria or alternatives with respect to qualitative criterion. These weights are not known, they are calculated in the analytic hierarchy process. If a_{ij} is an element of pair-wise comparison matrix, $a_{ij} \in \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, w_i is wanted weight of the element x_i, w_j is wanted weight of the element x_j for all i and j, we can write:

$$a_{ij} = \frac{w_i}{w_j},\ a_{ij} \in \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, \tag{1}$$

$$a_{ji} = \frac{1}{a_{ij}},\ a_{ji} \in \{1,2,3,4,5,6,7,8,9\}, \tag{2}$$

$$a_{ij} \cdot a_{ji} = 1,\ \text{for all } i, j = 1,2,...,n. \tag{'2}$$

Formula (2) corresponds to one of the pair-wise comparison matrix characteristic – the reciprocity.

Consistency is characteristic of pair-wise comparison matrix which expresses how much individual pair-wise comparisons are mutually consistent. This characteristic can be expressed by the following formula illustrating transitivity of pair-wise comparisons:

$$a_{ij} = a_{ik} \cdot a_{kj},\ i, j, k = 1,2,...,n \tag{3}$$

We have to compute the eigenvector $w = (w_1, w_2, ..., w_n), \sum_{i=1}^{n} w_i = 1$ corresponding to the maximal eigenvalue $\lambda_{\max}$ of the pair-wise comparison matrix A to determine result element priorities of the given matrix. Eigenvector w contents information about result priorities.

$$Aw = \lambda_{\max} w \tag{4}$$

Pair-wise comparison matrix is square, nonnegative and irreducible. These characteristics ensure existence of maximal eigenvalue $\lambda_{\max}$ and corresponding positive eigenvector [6]. The Wielandt theorem is used to compute the eigenvector, where e is unit vector and c is constant.

$$cw = \lim_{k \to \infty} \frac{A^k e}{e^T A^k e} \tag{5}$$

It is possible to measure the consistency, respective inconsistency of multiplicative pair-wise comparisons using multiplicative consistency index $I_{mc}(A)$ of pair-wise comparison matrix A:

$$I_{mc}(A) = \frac{\lambda_{\max} - n}{n-1}. \tag{6}$$

In case of consistent pair-wise comparison matrix $I_{mc}(A) = 0$. As it follows from formula (6) the multiplicative consistency index $I_{mc}(A)$ depends on dimension of the matrix. Therefore the multiplicative consistency ratio $CR_{mc}(A)$ was implemented. It is defined as ratio of multiplicative consistency index $I_{mc}(A)$ and its mean value $R_{mc}(n)$ calculated for randomly generated reciprocal matrices satisfying characteristics of multiplicative pair-wise comparison matrices. Values of $R_{mc}(n)$ are published e.g. in [7]. It is formulated as follows:

$$CR_{mc}(A) = \frac{I_{mc}(A)}{R_{mc}(n)}. \tag{7}$$

Generally the maximal acceptable value of the multiplicative consistency ratio is 10 %.

4. Aggregation of individual assessments and synthesis

Let us have group of n decision-makers evaluating m criteria $c_1, c_2, ..., c_m$. The evaluation of the i-th criterion performed by the j-th decision-maker is signed as h_{ij} considering $h_{ij} > 0$, $\sum_{i=1}^{m} h_{ij} = 1,\ j = 1,2,...,n$, i.e. evaluations are normalized. Evaluation of i-th criterion performed by all decision-makers is obtained by [6]:

$$h_i = \prod_{j=1}^{n} h_{ij} = h_{i1} \cdot h_{i2} \cdot ... \cdot h_{in},\ i = 1,2,...,m.. \tag{8}$$

The group evaluation of the i-th criterion is determined by:

$$H_i = \frac{h_i}{\sum_{i=1}^{m} h_i}. \tag{8}$$

satisfying condition of normalization $\sum_{i=1}^{m} H_i = 1$. We gain the group priority vector $w_G = (H_i), i = 1,2,..., m$. The required result, i.e. weights of alternatives, we obtain through synthesis of these information. If weight of i-th criterion is H_i and weight of j-th alternative with respect to criterion f_i is $v_j(f_i)$, the overall weight E_j of j-th alternative with respect to the goal is:

$$E_j = \sum_{i=1}^{m} H_i \cdot v_j(f_i). \tag{10}$$

where $j = 1,2,...,n$. On the basis of overall weights it is possible to rank evaluated alternatives from the best to the worst. Of course the best alternative gains the highest weight and vice versa.

5. Application

The analytic hierarchy process is used to compute priorities of indicators which are determined by each evaluator/decision-maker separately and independently on each other. Afterwards, these priorities are aggregated and overall priorities of indicators are

gained. This procedure enables to rank Czech NUTS 2 regions according to achieved competitiveness.

Pair-wise comparison matrices based on expert estimations of decision-makers K, L, M (indicators are in order: ER, GDP, GERD, GFCF, KIS, NDI, PAT) are following:

$$K = \begin{bmatrix} 1 & 1/2 & 6 & 5 & 7 & 3 & 8 \\ 2 & 1 & 5 & 4 & 7 & 3 & 9 \\ 1/6 & 1/5 & 1 & 1/2 & 2 & 1/4 & 3 \\ 1/5 & 1/4 & 2 & 1 & 4 & 1/3 & 6 \\ 1/7 & 1/7 & 1/2 & 1/4 & 1 & 1/6 & 3 \\ 1/3 & 1/3 & 4 & 3 & 6 & 1 & 7 \\ 1/8 & 1/9 & 1/3 & 1/6 & 1/3 & 1/7 & 1 \end{bmatrix}, \quad L = \begin{bmatrix} 1 & 1/8 & 1/3 & 1/5 & 1/3 & 1/4 & 3 \\ 8 & 1 & 7 & 5 & 8 & 3 & 9 \\ 3 & 1/7 & 1 & 1/3 & 2 & 1/2 & 5 \\ 5 & 1/5 & 3 & 1 & 4 & 1/2 & 5 \\ 3 & 1/8 & 1/2 & 1/4 & 1 & 1/3 & 4 \\ 4 & 1/3 & 2 & 2 & 3 & 1 & 5 \\ 1/3 & 1/9 & 1/5 & 1/5 & 1/4 & 1/5 & 1 \end{bmatrix},$$

$$M = \begin{bmatrix} 1 & 1/2 & 1/7 & 1/6 & 1/8 & 1/4 & 3 \\ 2 & 1 & 1/6 & 1/5 & 1/5 & 1/3 & 4 \\ 7 & 6 & 1 & 4 & 3 & 5 & 8 \\ 6 & 5 & 1/4 & 1 & 1/2 & 2 & 7 \\ 8 & 5 & 1/3 & 2 & 1 & 4 & 9 \\ 4 & 3 & 1/5 & 1/2 & 1/4 & 1 & 5 \\ 1/3 & 1/4 & 1/8 & 1/7 & 1/9 & 1/5 & 1 \end{bmatrix}.$$

We compute the multiplicative consistency ratios of pair-wise comparison matrices K, L and M and corresponding priority vectors (where indicators are in order: ER, GDP, GERD, GFCF, KIS, NDI, PAT): $CR_{mc}(K)$ = 0.052 with priority vector w_K = (0.292, 0.338, 0.053, 0.091, 0.036, 0.167, 0.022), $CR_{mc}(L)$ = 0.063 and the priority vector w_L = (0.039, 0.456, 0.088, 0.157, 0.064, 0.171, 0.025) and $CR_{mc}(M)$ = 0.062 with priority vector w_M = (0.035, 0.052, 0.395, 0.159, 0.241, 0.096, 0.022). All consistency ratios are less than 0.1, i.e. all pair-wise comparison matrices are sufficiently consistent. According to (9) we obtain the group weights of indicators w_G = (0.026, 0.503, 0.118, 0.143, 0.036, 0.174, 0.001), which give these weights and rankings of Czech NUTS 2 regions (Tab. 1 and Tab 2.):

Tab. 1 Group weights of Czech NUTS 2 regions in years 2000 – 2006 and average weights

Region/Year	2000	2001	2002	2003	2004	2005	2006	Ø
Praha	0.244	0.249	0.255	0.254	0.259	0.260	0.263	0.255
Střední Čechy	0.139	0.139	0.138	0.134	0.134	0.133	0.127	0.135
Jihozápad	0.112	0.109	0.107	0.109	0.110	0.110	0.110	0.109
Severozápad	0.094	0.094	0.092	0.096	0.092	0.090	0.090	0.093
Severovýchod	0.107	0.104	0.105	0.104	0.104	0.102	0.100	0.104
Jihovýchod	0.111	0.109	0.109	0.113	0.110	0.113	0.108	0.110
Střední Morava	0.097	0.099	0.100	0.096	0.095	0.095	0.096	0.097
Moravskoslezsko	0.095	0.096	0.094	0.094	0.096	0.098	0.107	0.097

Source: Own computations

Tab. 2 Final ranking of Czech NUTS 2 regions in years 2000 – 2006 and average ranking

Region/Year	2000	2001	2002	2003	2004	2005	2006	Ø
Praha	1	1	1	1	1	1	1	1
Střední Čechy	2	2	2	2	2	2	2	2
Jihozápad	3	3	4	4	4	4	3	4
Severozápad	8	8	8	6	8	8	8	8
Severovýchod	5	5	5	5	5	5	6	5
Jihovýchod	4	4	3	3	3	3	4	3
Střední Morava	6	6	6	7	7	7	7	7
Moravskoslezsko	7	7	7	8	6	6	5	7

Source: Own computations

From Tab. 2 is obvious that first and second positions do not change through the 7-years period. Praha and Střední Čechy can be considered as two most competitive regions in the Czech Republic. Jihozápad and Jihovýchod alternate on the third and fourth position. Severovýchod is the fifth most competitive region. Střední Morava is alternated by Moravskoslezsko on the sixth and seventh position. Except the year 2003, Severozápad is the least competitive region. Moravskoslezsko has been changed own position during programming period very significantly (from seventh position in 2000 to fifth position in 2006). From the methodological point of view, we would like to stress that our paper doesn't seek reasons of these changes inside of regions. We don't work with contemporary programming period, because it has not been over yet. In our next research we would like to make comparison between both programming periods.

Conclusion

In this paper we applied one of multicriteria decision making method – the analytic hierarchy process – in evaluation of regional competitiveness on NUTS 2 level in the Czech Republic. This method was used to calculate weights of criteria determined by three evaluators individually. These three priority vectors were aggregated and final group weights of criteria (i.e. of macroeconomic indicators) were gained. This procedure enabled to take different experts' estimations into consideration.

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Development of Performance Measurement System According to Business Environment: An SME Perspective

Abstract

Organizations often introduce performance measurement system (PMS) in order to evaluate the level of their performance, make comparison with competitors and plan their future activities. An importance of performance measurement and its information has increased when business environment of today has become more dynamic and competitive. Organizations are confronting unprecedented radical changes to which they must adapt to in order to survive and prosper. Processes of adaptation and reaction to business environment could be ensured by a fast decision making process, an apropos information and a suitable data flow. Since consistent, logical and strategic decisions could affect the conformance to uncertain and complex environment, the design, features and implementation of a performance measurement system should always conform to business environment. According to position of small and medium-sized enterprises (SMEs), implementation of new theoretical performance measurement methods passes over with rational usage of internal resources. This influence the need to search for new possibilities to development of performance measurement system. However there is a lack of literature concerning development of performance measurement system inside SME. The aim of this paper is to investigate an internal recourses based development of performance measurement system according to business environment. Research results are based on the quantitative approach (questionnaire survey) of Lithuanian SMEs. The results can guide SMEs in the selection of a performance measurement system which conforms to business (external and internal) environment considering particular factors such as the state of business environment, structure of performance measurement system or rational usage of internal resources.

Key Words

business environment, performance measurement, small and medium-sized enterprises

JEL Classification: M20, M40

Introduction

Present business environment conditions of rapid change require agility, flexibility and innovation. Together with strategic objectives, processes and measures, these dimensions belong to the set of indicators that organizations use to measure the success of their performance. It is noticeable that importance of performance measurement was growing in changing and complex business environment and internal potential of organization [24, 17]. Organizations implement performance measurement systems

(PMS) in order to manage and assess their processes. The strategic goals are translated into indicators. In this way managers verify if targets are met, allocate resources and choose what strategy to implement [26]. Since consistent, logical and strategic decisions could affect the conformance to uncertain and complex environment, the design, features and implementation of a performance measurement system should always conform to business environment. The selection of the most appropriate PMS or set of indicators is very critical. In the design of the most representative PMS managers often consider properties such as conformity with the monitored goals, exhaustiveness, cost of data acquisition, simplicity of use, etc. [1, 16, 18, 23]. However, this analysis may not provide enough information in choosing the structure and features of PMS according to business environment.

Small and medium-sized enterprises (SMEs) are important to maintain strong economic growth. However, how to sustain their performance in the long term is a big challenge [3]. For SME, the adoption of advanced managerial practices in the main business processes is a key to the successful improvement of their business performance and competitiveness. According to position of SME, implementation of new theoretical performance measurement methods passes over with rational usage of internal resources. Therefore, there is a clear need to stimulate the development of performance measurement system in SMEs considering the factors characterizing these companies [5]. This influence the need to search for new possibilities of development of performance measurement system for SMEs. There are a number of well recognized characteristics that differentiate SMEs from larger organizations [7] and these factors inevitably impact performance measurement process. However there is a lack of literature concerning development of performance measurement system inside SME. Moreover, all of the authors mainly focused on limited aspects of performance measurement – operations, manufacturing, service, technology, strategic – while none of the papers offers a broader and more comprehensive view of all the performance measurement practice in SMEs.

The aim of this paper is to investigate an internal recourses based development of performance measurement system according to business environment. The paper includes tree main parts. The development of a theoretical framework from institutional, contingency and complexity theories point of view is presented in the first part. In order to point out the different dimensions of business environment influence on the content and features of performance measurement system, quantitative research was performed. Research methodology is presented in the second part of the paper. Research (survey) results in Lithuanian SMEs are presented in the third part of this paper.

1. Theoretical background

1.1 Identification of business environment

According to open systems theory organization interacts with, adapts to and seeks to control its environment in order to survive [4]. Institutional theory as theoretical

approach of management studies is analyzed and shows that institutional theory identifies internal and external environmental factors as institutional factors, according to which the behavior of an organization could be disclosed and researched [4, 13, 14]. This shows that according to institutional factors internal and external environment of organization could be recognized. The analysis of different institutional factors groups showed that institutional factors perform in different ways. Two groups of institutional factors – economic and coercive – perform irrespective of an organization and other two groups – normative and mimetic – depend on the reaction of organization. According to this aspect it could be stated that institutional factors could perform in two levels: (1) organizational level, (2) environmental level and help to recognize internal and external environment of organization.

As contingency theory postulates, that different organizations perform in different ways in the same environmental circumstances and provides a methodology for recognition of an external environment of organization [28]. According to this aspect, uncertainty level of external environment is used for a state identification of external environment. External environment of organization which is understood as an entirety factors of social and political-law influencing decisions, performance processes in organizations. Mentioned factors are aggregated into a list according to institutional factors and consider variables (x_{in}). These variables could be described according changes and uncertainty. According to this aspect, external environment of organization is measured by the *level of uncertainty*, which is the result of changes in variables (x_{in}).

According to limitations of contingency theory, an integration of two theories was proposed choosing complexity theory, which helped to disclose reaction of organization to environment and its influence on performance measurement system. Such a reaction is used to recognize the state of an internal environment of organization [2, 8]. Internal environment of organization is understood as an entirety factors associated with organization. Mentioned factors are aggregated into a list according to institutional factors and consider variables (x_{jn}). According to complexity theory it could be stated that factors of internal environment are developed as a reaction to the level of uncertainty and could be described according to *level of complexity* of variables (x_{jn}).

According to analyses above, an intensity of institutional factors was disclosed using an uncertainty and a complexity levels and is substantiated different intensity of institutional factors influence on performance measurement system which could be disclosed according to its structure. Presuming that organizations react to thier external environment ($ENVIR_{ex}$) by the level of uncertainty of variables (x_{in}) and such a reaction is found in an internal environment of organization ($ENVIR_{in}$) by the level of complexity of variables (x_{jn}), it could be stated the dependency:

$$ENVIR_{ex} = f\left(x_{in}\right) \Rightarrow ENVIR_{in} = f\left(x_{jn}\right). \quad (1)$$

Analyses made and dependency determined let to state, that external environment of organization assumes static or dynamic state [28] to which reaction of organization assumes simplicity or absorption [2, 8]. Based on these thoughts, we predict that there is

an interaction effect between an external environmental uncertainty and an internal environment reaction:

H1. An external environmental uncertainty and an internal environment reaction will have a positive interaction.

1.2 Characteristics of performance measurement system in SMEs

A performance measurement system (PMS) is vital in the management of an organization. It does not only tell whether an organization is successful, but, if used properly, can also help an organization implement their strategies. At the same time, if the design and implementation of the PMS are not done with care, the PMS could lead to dysfunctional behavior and in the end could harm the entire organization [19]. Parker [21] and Kuwaiti [12] analyzed performance measurement as a main management tool for decision making, control and ensuring useful information for effective resource allocation. Olsen *et. at*. [20], Marchand and Raymond [15] researched performance measurement as a system for information integration, useful for implementation of objectives in organization and combined inside. Kumar *et.al*. [11] stated that performance measurement helps to form strategy of organization, manage and change performance, resources allocation, motivation of employees and ensure permanent success. Gunawan, Ellis-Chadwick and King [9] analyzed performance measurement as a tool for a performance improvement and strategic planning. Tucker and Pitt [27] researched that performance measurement helps to evaluate and change performance goals and increase value creation. Hence, it can be argued that the performance measurement system is a set of instrumentations of performance measurement (*measures*), ensuring information about an internal environment of organization, which could be used for a measurement of *strategy*, *goals* and *processes* and become a knowledge, which could be used for a decision making (*strategic, tactic, operative level*) process and convert to wisdom, ensuring feedback and adaptation to external environment.

Despite the availability of various models and methodologies supporting the implementation of performance measurement practices [25], their adoption in SMEs is still low, and it is necessary to identify approaches that meet the specific needs of these companies [6, 10]. The above performance measurement system definitions and their constituent activities do not consider company size. However, performance measurement within the context of SMEs requires a deeper understanding of SME characteristics [3]: short-term priorities, internal operational focus and lack of external orientation, looking for flexibility, poor managerial skills, command and control culture, entrepreneurial orientation, limited resources.

We state that level of external environmental uncertainty and level of internal environment reaction to it could be dimensions according to which content of PMS (strategy, goals, processes, measures and decision making) could be researched in SMEs. We predict the influence of the business environment on performance measurement system in the following hypotheses:

H2. Increasing level of dynamism defines rising demand for variety of information and could influence higher number of used measures and processes for strategy implementation.

H3. Increasing level of absorption defines rising demand to catch all external opportunities and could influence high level of strategy complication, variability of underlying goals and measures information usage for a wide range of decision making.

2. Methodology

In order to point out content of performance measurement system according to the dimensions of business environment, a quantitative research (questionnaire survey) was performed. The questionnaire consists of three parts: part one is related to the background information of the company, part two is related to the characteristics of a business environment and part three is related to the PMS information. The time required to fill in the questionnaire was approximately 20 minutes.

External environment of organization was analyzed according to the frequency of changes of external environment, which means an environment is static or dynamic and in this case respondents need to mark frequency of listed changes using Likert scale (*changes in customer needs, in product/service, in pricing policy, in technology, in competition, in legislation*).

Reaction to environment was analyzed according to complexity – an organization tries to absorb or simplify external environment. Complexity was analyzed in four ways using Likert scale – *strategy complexity, goal complexity, structural complexity and interaction complexity*. Strategic complexity was measured using two (cost leadership and differentiation) strategies by asking to indicate the importance of 12 items. Goal complexity was assessed by asking to indicate the importance of 10 goals. Structural complexity was measured according to the level of formalization which was measured using 6 items that addressed the degree to which rules were observed in the organization. Interaction complexity was assessed by asking to indicate a number of different groups highly involved in resolving 7 strategic issues.

Performance measurement system was analyzed according to *measures, strategy*, underlying *goals, processes* for strategy implementation and range of *decision making* in an organization. Measures were assessed by asking to indicate the usage of 28 measures from 6 main measures groups (*financial, market, customer, internal process, employees, innovation and growth*). The strategy, using Likert scale, was measured according to two (*cost leadership and differentiation*) strategies by asking to indicate the importance of 6 items. In goals case, respondents ought to mark reachable goals from 2 goal groups: *long-term and short-term*. The processes, using Likert scale, were measured according to value chain by asking to indicate the importance of 6 activities. A range of decision making was measured using 3 (*operational, tactical, strategic*) decision making levels by asking to indicate the usage of 28 measures for different decision making levels.

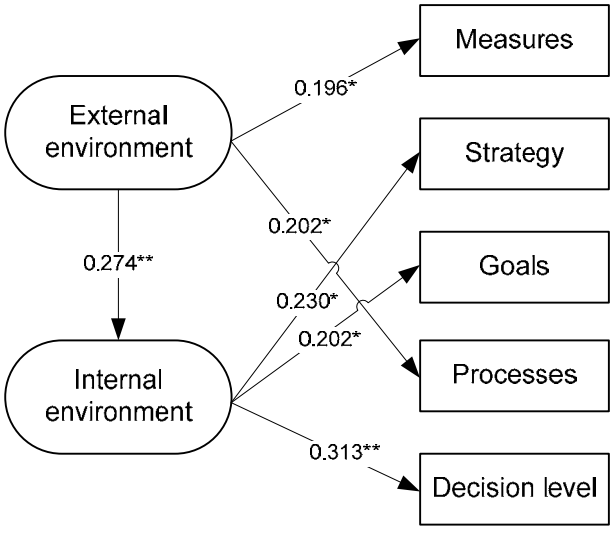
After the data was collected, Spearman correlation coefficient was used to confirm the validity of proposed hypothesis by using SPSS (*Statistical Package for Social Sciences*) and Statistica software.

3. Research results

Questionnaire was undertaken to collect data in this survey. A total 589 online questionnaires were distributed to randomly selected SMEs managers in various industries in Lithuania in April to July 2010 via personal emails. Of the questionnaires 170 were finally returned. Out of the 170 questionnaires, 62 were eliminated from the analysis as same data was missing. This left 108 questionnaires for further analysis giving a response rate of 18.3 per cent.

Resuming research results, it could be stated that frequency of changes in customer needs, product/service, pricing policy, technology, competition and legislation show dynamic and static environment of the organization. Research results show that 41 percent of all SMEs have static and 59 percent – dynamic business environment. According to the research results, it could be stated that complexity shows organization's reaction – simplicity and absorption – to external environment. The research results show that 66 percent of all SMEs try to absorb ongoing changes in external business environment. The study has analyzed configurations of two dimensions of external environment and two dimensions of internal environment, a total of four constructs. Hence the total cluster analysis was based on four constructs. Based on the hierarchical procedure undertaken, the number of clusters was set at two for each external and internal environment separately. Cluster analysis lets to prove that classification according to external and internal environment is purposive.

Fig. 1 Results of Spearman correlation coefficient analysis



Note: * $p < 0.05$; ** $p < 0.01$

Source: own

The proposed hypothesis is verified by quantitative study using Spearman correlation coefficient as presented in Figure 1. According to research results could be stated that a positive interaction between an external environmental uncertainty and an internal environment reaction was identified. The first hypothesis could be confirmed.

According to research results could be stated that increasing level of dynamism could influence higher number of measures and flexible processes for strategy implementation in SMEs. Organizations operating in static external environment used less measures than operating in dynamic external environment, because increasing level of dynamism defines rising demand for variety of information and in order to get it organizations use more measures in different performance processes.

Analyzing research results in an internal environment point of view could be stated that increasing level of absorption could influence strategy complication, variability of underlying goals and measures information usage for a wider range of decision making in SMEs. This could be explained, that organizations trying to catch all external opportunities could not be in time to correct strategy and underlying goals according to new conditions, their reaction could be found in a wider decision making level.

Analyzing research results correlations were also found between internal environment and (1) measures 0.349, which was statistically significant ($p<0.01$) and (2) processes 0.210, which was statistically significant ($p<0.05$). Such interactions could be explained that information of measures for SMEs is useful for identification of an internal potential rather than to meet the requirements of information demand about external environment. The empirical data confirmed that internal operational focus and lack of external orientation still affects many SMEs and as result affecting performance measurement process.

Also a correlation was found between the size of an organization (small-sized, medium-sized and large) and decision making level 0.420, which was statistically significant ($p<0.01$). According to this result could be stated that measurement information could mostly be informally used for a narrow decision making in SMEs. The empirical data confirmed that SMEs have flexible processes that are not very structured.

Conclusion

The globalization of market and production processes is triggering continuous changes within organizations in order to be competitive. In today's dynamic business environment especially small and medium size enterprises (SMEs), are challenged to adapt to rapid market changes. Such a change within the business perspective emphasizes that organizations need fast, accurate and flexible information about external possibilities and internal potential. This informational demand could be ensured by PMS. PMS is usually introduced by organizations in order to monitor the achievement of goals, to allocate resources and to implement a selected strategy. This process could be successfully ensured if PMS would reflect business environment in which organization is operating. The identification of conformity between performance

measurement and business environment is one of the most critical issues. For SMEs, the adoption of PMS according to business environment is a key to the successful improvement of their business performance and competitiveness. However, it could be mentioned two special aspects that SMEs (1) experience difficulties in adopting new and innovative performance measurement methods, (2) is not a scaled-down version of a large organization and PMS what was suitable for a large organization could not be suited for a SME. This paper investigated an internal recourses based development of PMS according to business environment, a methodology to evaluate business environment and structure of PMS.

Based on empirical research analyses influence of business environment on the structure of PMS, possibilities to adapt it information and usage for a decision making process could be verified.

Based on the aspects of SME recommendations could be stated that reaching to develop PMS according to business environment, the external environment should be scanned regularly to identify and monitor factors that may have an impact on SME businesses. Dynamic external environment raises demand for variety of an information influencing importance of different measures (financial, market, customer, internal process, employees, innovation and growth). According to research results, financial and market measures should mostly be taken into account operating in a static external environment. External orientation should be implemented through effective internal/external communication. This integrated approach will also help to motivate and enable the organization's members to develop a common understanding and to work towards common goals. As the literature points out [22], the success of SMEs in today's turbulent markets depends largely on their ability to engage in environmental scanning activities in order to understand the behavior of external stakeholders and trends.

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Analysis of Social-Economic Impacts of the Process of Globalization in the Developing World

Abstract

There has been no shortage of theories and papers explaining why globalization may have adverse, insignificant, or even beneficial impacts on income and even social inequality. Surprisingly, the empirical reality remains an almost complete mystery. In this paper, the very recent data on income inequality as well as indicators of the social inequalities (in the sense of fair access to health care and education) have been used to examine this controversial issue. Since these data do not come yet in a satisfactorily long time series, the cross-sectional analysis remains the only option for the research. On the other hand, the process of globalization has been analyzed and quantified by the Swiss Economic Institute Konjunkturforschungsstelle (KOF) back to 1980 for most of the countries which makes it possible to apply the longitudinal analysis. This article combines both to search for the impact that the pace of globalization may have in the developing countries. The conclusions are rather surprising: The pace of globalization has very weak (but still significant) positive impact on income inequalities in the sample of 87 developing countries, but it has quite strong negative impact on social inequalities in these economies. Thus, the overall effect on reduction of human development due to income and social inequalities is the strongest in the countries that globalized themselves slowly in the previous two decades, while those that globalized their economies faster enjoy now more equalized societies (mainly in the sense of equal access to health care and education).

Key Words

globalization, human development, Konjunkturforschungsstelle (KOF), Human Development Index (HDI), Inequality-adjusted Human Development Index (IHDI), economic inequality, social inequality

JEL Classification: E02, O11, O15

Introduction

Increased global economic integration, globally interconnected and interdependent social, political, cultural, and environmental developments are often referred to as "globalization". During the last two decades, political relations, social networks, movement of labor, and institutional change have become more and more involved. Globalization measures or indices have been employed to intermediate an insight into the nature of investment climate, into the development and changes of growth, to understand the international business environment as well as to provide a global perspective which the policy initiatives will be operational within.

The impacts of globalization on economic growth have been tested frequently. The studies on this topic can be distributed into two groups: The first one (and also the more numerous one) includes studies presenting cross sectional estimates (e.g. Chanda [7], Rodrick [20], Garret [13], Bednářová et al. [3]) or studies providing detailed analysis of individual sub-dimensions of globalization (e.g. Borensztien [6], Greenaway et al. [14], Dollar et al. [9], Dreher et al. [11], Kocourek et al. [16]). The second group consists of studies trying to measure overall globalization: the G-index introduced by World Markets Research Centre (Randolph [19]), the co-operation between A. T. Kearney Consulting group and Foreign Policy Magazine resulting in ATK/FP index of globalization [2], KOF globalization index presented by Swiss Economic Institute [17], and others [3]. Recent empirical studies have proved (e.g. Dreher [10]), countries that were more globalized, experienced higher growth rates.

Among the first to use KOF Index for empirical analysis was Ekman [12], who identified a positive correlation between globalization and level of health measured by life expectancy at birth. Later, Sameti [21] found that globalization increased the size of governments, while Tsai [22] proved that globalization increased human welfare. Bjørnskov [5] analyzed the tree dimensions of the KOF Index and showed that economic and social globalization affected economic freedom, while political globalization did not.

This paper is focused on the question whether the globalization has the power to reduce inequality of redistribution of the resources and opportunities in a society. Amavilah [1] discovered that the social dimension of globalization has the most intensive effects on the human development. Bergh and Nilsson [4] identified positive effects of globalization on the life expectancy. Kraft et al. [18] discussed the different outcomes of globalization in developed market economies and in developing countries.

The main hypothesis of this paper is that the **process** of globalization equalizes the differences in distribution of income and in access to health care and education in developing countries. The starting point for this paper lies in conclusions of Kraft et al. [18], where authors found out that the globalization is connected with lower economic and social inequalities in the developed market economies, but it does not contribute to reduction of economic and social inequalities in the developing countries. However, the analysis in Kraft et al. [18] is purely cross-sectional, comparing the momentary **state** in different countries. This contribution combines the cross-sectional approach with time-series statistical methods (longitudinal approach), which may lead to more complex and more exciting conclusions.

After addressing the methodological issues of the research, the paper focuses on the analysis of links between the loss in human development caused by inequalities in distribution of wealth and public goods (such as education and health care) and the average pace of globalization in the developing countries. The findings will be summed up in conclusion and possible directions for further research will be introduced.

1. Methodology

For the purpose of this article, the American CIA [8] definition of the group of developing countries will be used. The level of globalization will be measured by the KOF Globalization Index [17]. The economic and social inequalities will be calculated using the Human Development Report data and methodology [23]. The total Human Development Index (*HDI*) is a geometric mean of three partial indices: income index (*II*), education index (*EI*), and life expectancy index (*LEI*), while the Inequality-Adjusted Human Development Index (*IHDI*) is defined as a geometric mean of inequality-adjusted income index (*III*), inequality-adjusted education index (*IEI*), and inequality-adjusted life expectancy index (*ILEI*):

$$HDI = \sqrt[3]{II \cdot EI \cdot LEI} \tag{1}$$

$$IHDI = \sqrt[3]{III \cdot IEI \cdot ILEI} \tag{2}$$

The general level of inequalities in each country will be quantified as a difference between the level of the Human Development Index (*HDI*) and the Inequality-Adjusted Human Development Index (*IHDI*) and will be referred to as a Human Development Loss:[1]

$$Human\ Development\ Loss = HDI - IHDI \tag{3}$$

The Human Development Loss is in fact a part of the total *HDI* score that has not been reached because of the existing inequalities in the particular country. Since various inequalities manifest themselves in all three components of *HDI*, it is possible to separate the income inequalities from the inequalities in access to health care and education (social inequalities). The measure of the extent of income inequalities can be written as follows (4), while the size of social inequalities can be estimated using (5):

$$Loss\ Due\ to\ Income\ Inequality = II - III \tag{4}$$

$$Loss\ Due\ to\ Social\ Inequalities = \sqrt[2]{EI \cdot LEI} - \sqrt[2]{IEI \cdot ILEI} \tag{5}$$

These three measures of inequalities (overall Human Development Loss, Loss Due to Income Inequalities, and Loss Due to Social Inequalities) will be tested for having a relation with the ongoing process of globalization. The average annual pace of this process will be estimated as a slope of the linear trend line[2] of the KOF Globalization Index time series. The Pace of Globalization will be quantified for each developing country separately following the equation (6):

$$Pace\ of\ Globalization = \frac{n \cdot \sum KOF_i \cdot year_i - \sum year_i \cdot \sum KOF_i}{n \cdot \sum year_i^2 - \left(\sum year_i\right)^2} \tag{6}$$

[1] For more detailed explanation and discussion see e.g. Kraft et al. [18] or Bednářová et al. [3].

[2] For more detailed explanation see e.g. Hindls et al. [15].

where *n* is the length of the time series. Only countries with at least twenty-year-long record of KOF Globalization Index will be used, which guarantees a higher robustness of the trend analysis and also leads to exclusion of most of the "countries in transition" from the analysis. The development of the "countries in transition" will not be the subject of the research in this paper.

The following analysis will be carried out only for such developing countries, whose level of globalization can be traced at least twenty years back from now and whose level of human development and inequality-adjusted human development has been measured by the United Nations Development Programme in 2012 [23]. Therefore, the sample will consist only from the following 87 countries: Angola (AGO), Albania (ALB), Argentina (ARG), Azerbaijan (AZE), Benin (BEN), Burkina Faso (BFA), Bangladesh (BGD), Bulgaria (BGR), Bolivia (BOL), Brazil (BRA), Bhutan (BTN), Central African Republic (CAF), Cote d'Ivoire (CIV), Cameroon (CMR), Republic of Congo (COG), Colombia (COL), Costa Rica (CRI), Cyprus (CYP), Djibouti (DJI), Dominican Republic (DOM), Ecuador (ECU), Egypt (EGY), Ethiopia (ETH), Gabon (GAB), Ghana (GHA), Guinea (GIN), Guinea-Bissau (GNB), Guatemala (GTM), Guyana (GUY), Honduras (HND), Haiti (HTI), Hungary (HUN), Chile (CHL), China (CHN), Indonesia (IDN), India (IND), Jamaica (JAM), Jordan (JOR), Kenya (KEN), Cambodia (KHM), South Korea (KOR), Lao (LAO), Lebanon (LBN), Liberia (LBR), Lesotho (LSO), Morocco (MAR), Madagascar (MDG), Maldives (MDV), Mexico (MEX), Mongolia (MNG), Mozambique (MOZ), Mauritania (MRT), Mauritius (MUS), Malawi (MWI), Namibia (NAM), Niger (NER), Nigeria (NGA), Nicaragua (NIC), Nepal (NPL), Pakistan (PAK), Panama (PAN), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROM), Rwanda (RWA), Senegal (SEN), Sierra Leone (SLE), El Salvador (SLV), Sao Tome and Principe (STP), Suriname (SUR), Swaziland (SWZ), Syria (SYR), Chad (TCD), Togo (TGO), Thailand (THA), Trinidad and Tobago (TTO), Tanzania (TZA), Uganda (UGA), Uruguay (URY), Venezuela (VEN), Vietnam (VNM), Yemen (YEM), Democratic Republic of Congo (ZAR), Zambia (ZMB), and Zimbabwe (ZWE).

2. Results

It seems rather obvious the pace of the globalization process is dependent on the quality of institutions in each country, because these institutions are responsible for globalizing the economy or society or because the globalization requires establishment or modifications of these institutions.

The institutional quality is also crucial for an equal and fair access to health care, education, as well as for offering the equal and fair working opportunities to people. Therefore a negative relation between the pace of globalization and the extent of Human Development Loss was assumed.

2.1 Human Development Inequality and the Pace of Globalization

The regression analysis of the Pace of Globalization (horizontal axis, *X* in the table) and the Human Development Loss (vertical axis, *Y* in the table) brought results summed up in the Tab. 1 and Fig. 1.

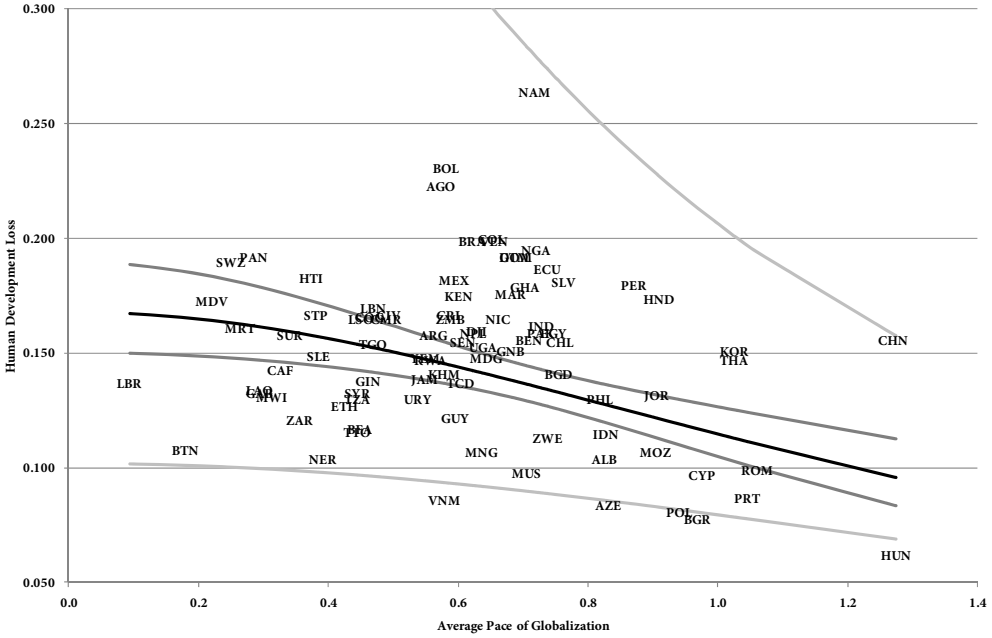
Tab. 1 Modeling the Relation between the Human Development Loss and Average Pace of Globalization (in the Years 1980 – 2010)

Model Reciprocal-*Y* Squared *X* $Y = \frac{1}{(a + b \cdot X^2)}$		*t*-statistics	*P*-value
Parameter *a* (intercept)	5.96266	17.1457	0.0000
Parameter *b* (slope)	2.75411	4.29074	0.0000
F-test	18.41		0.0000
R-Squared	17.8033 %		
R-Squared Adjusted	16.8362 %		

Source: [author's calculations]

The assumption of negative relation between Pace of Globalization and Human Development Loss has been confirmed on the 95% level of confidence, but the strength of the connection between the Pace of Globalization and the Human Development Loss is rather weak. The model is capable of explaining only less than 17 per cent of variability in Human Development Loss, which indicates, that the Pace of Globalization is – most probably – not the strongest factor influencing inequalities in the developing countries.

Fig. 1 Relation between the Human Development Loss and the Average Pace of Globalization (in the Years 1980 – 2010)



Note: The dark line illustrates the fitted model; the limits for forecast means are depicted by the narrow band; and the limits for individual predictions are depicted by the wide band. They are all at the confidence level of 95.0 %.

Source: [author's calculations]

2.2 Income Inequality and the Pace of Globalization

The regression analysis of the Pace of Globalization (horizontal axis, *X* in the table) and the fraction of the Human Development Loss caused by the income inequality (vertical axis, *Y* in the table) led to even less robust results (see Tab. 2 and Fig. 2) than the previous section.

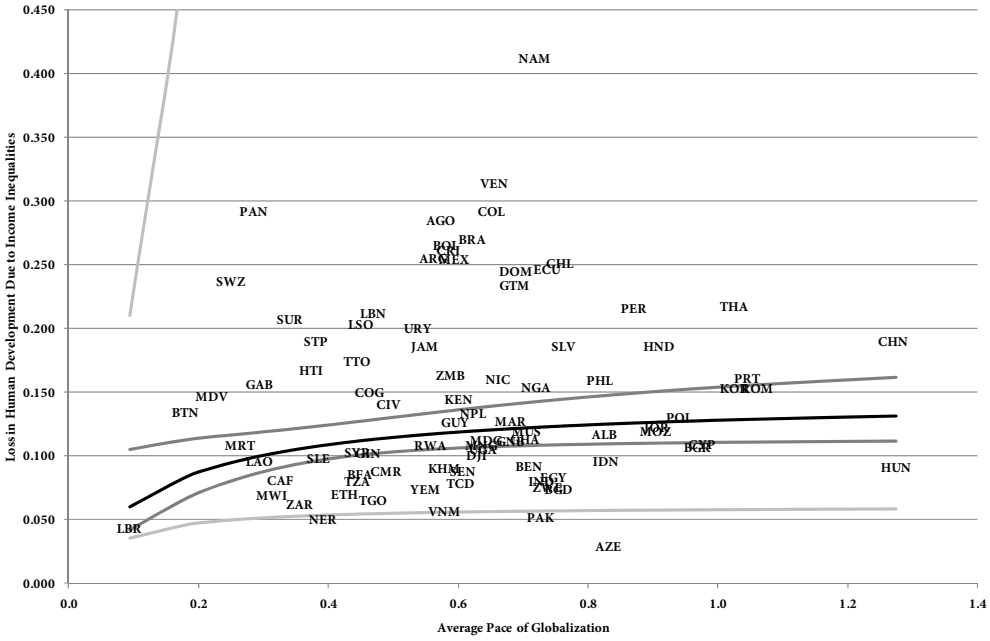
Tab. 2 Modeling the Relation between the Human Development Loss Caused by Income Inequality and the Average Pace of Globalization (in the Years 1980 – 2010)

Model Double Reciprocal $Y = \frac{1}{(a + \frac{b}{X})}$		*t*-statistics	*P*-value
Parameter *a* (intercept)	6.86406	7.25761	0.0000
Parameter *b* (slope)	0.911548	2.24914	0.0271
F-test	5.06		0.0271
R-Squared	5.61704 %		
R-Squared Adjusted	4.50665 %		

Source: [author's calculations]

The double reciprocal model is capable of explaining only 4.5 per cent of variability in Human Development Loss caused by the inequality in distribution of income. The linkage between the two indicators is very weak and hardly convincing.

Fig. 2 Relation between the Human Development Loss Caused by Income Inequality and the Average Pace of Globalization (in the Years 1980 – 2010)



Note: The dark line illustrates the fitted model; the limits for forecast means are depicted by the narrow band; and the limits for individual predictions are depicted by the wide band. They are all at the confidence level of 95.0 %.

Source: [author's calculations]

This is a rather surprising partial conclusion. Generally, globalization is considered for predominantly an economic phenomenon with numerous social and political spill-overs, that are – however – strongly driven by the economic "gearbox" of globalization (internationalization, liberalization of trade in goods and services, of international flows of capital and labor force, economic integration, etc.). This section has shown that the pace of globalization has significant, but very weak connection with the income inequalities in developing countries. Even more, this connection is positive, indicating that developing economies that globalized themselves in the previous two decades more rapidly or more intensively than others, are now facing slightly (but significantly) higher income inequalities than developing countries that integrated themselves to international relations more carefully.

2.3 Social Inequalities and the Pace of Globalization

The regression analysis of the Pace of Globalization (horizontal axis, *X* in the table) and the fraction of the Human Development Loss caused by the social inequalities (vertical axis, *Y* in the table) has supported the partial conclusions of section 2.1 (see Tab. 3 and Fig. 3).

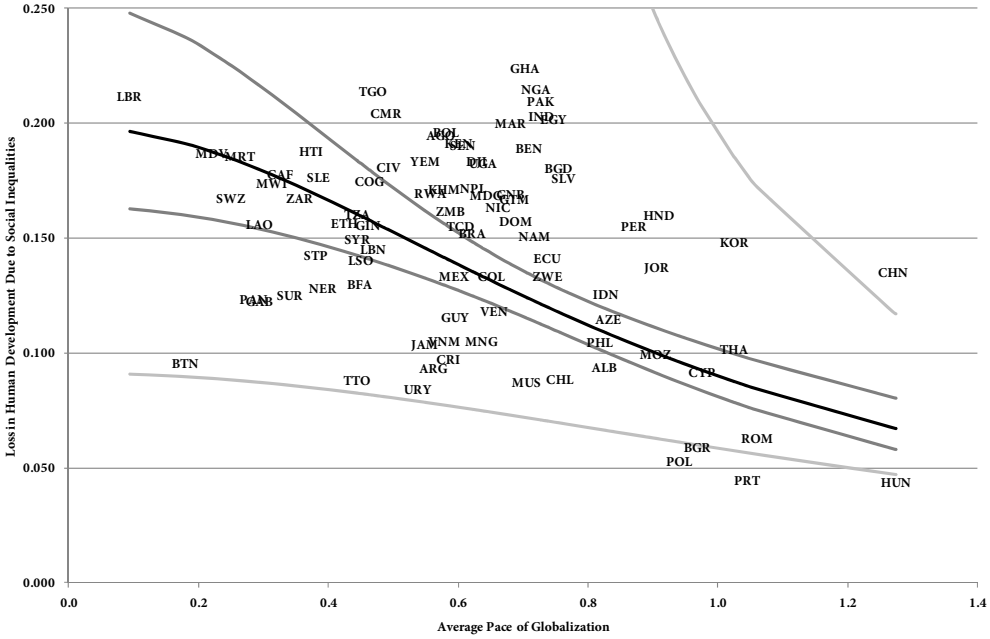
Tab. 3 Modeling the Relation between the Human Development Loss Caused by Social Inequalities and the Average Pace of Globalization (in the Years 1980 – 2010)

Model Reciprocal-*Y* Squared *X* $Y = \frac{1}{(a + b \cdot X^2)}$		*t*-statistics	*P*-value
Parameter *a* (intercept)	5.03532	9.37034	0.0000
Parameter *b* (slope)	6.0562	6.10611	0.0000
F-test	37.28		0.0000
R-Squared	30.49 %		
R-Squared Adjusted	29.6722 %		

Source: [author's calculations]

This model is capable of explaining nearly 30 per cent of variability in Human Development Loss caused by the inequality in access to public goods (such as health care and education). The connection between the two indicators is the strongest one from the three tested pairs. These results may appear quite surprising as they indicate that the developing countries that globalized themselves more rapidly since 1980 are now more socially equal, providing their inhabitants with more fair access to health care and education. The shape of the model also suggests, the social inequalities could be most intensively reduced in such developing countries that add (on average) to their KOF score every year approximately 0.5 – 0.9 points. Developing countries that integrate themselves to the global economy more slowly fight generally larger social inequalities, but also the spread (variance) of the extent of social inequalities grows higher with the lower average annual Paces of Globalization.

Fig. 3 Relation between the Human Development Loss Caused by Social Inequalities and the Average Pace of Globalization (in the Years 1980 – 2010)



Note: The dark line illustrates the fitted model; the limits for forecast means are depicted by the narrow band; and the limits for individual predictions are depicted by the wide band. They are all at the confidence level of 95.0 %.

Source: [author's calculations]

Conclusions

The analysis was focused on the impact of the pace of globalization on inequalities in the Third World. The main conclusion is that the pace of globalization has significant negative effect on the extent of inequalities in the developing economies, especially on the discrimination in access to education and health care (i.e. social inequalities). On the other hand, the linkage between the pace of globalization and the income inequality remains very weak (though still statistically significant) and positive. The pace or intensity of the process of globalization has therefore prevailing beneficial social impacts in the developing countries, while its adverse income effects are quite indistinctive. This crucial result corresponds to a certain extent with conclusions of Amavilah [1], Bergh et al. [4], and Kraft et al. [18] and supports the finding of the importance of social dimension of globalization in the developing world. It also rectifies the conclusions of Dreher and Gaston [11].

The analyzed issue offers an interesting space for future research in two different directions: 1) A tempting task would be to compare the impacts of the process (pace) of globalization in developed market economies with developing countries and "countries in transition". 2) An important and very appropriate question could rest in economic and social impacts of sub-dimensions (economic, social, and political) of globalization and their individual paces.

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Influence of Corruption on Economic Growth: A Dynamic Panel Analysis for OECD Countries

Abstract

Corruption and its reduction is one of the constant topics we encounter not only at the level of debates among political and economic authorities, but thanks to its expansion it has become part of everyday life of today's society. The issue of corruption is a major issue in almost every country, including the Czech Republic. We are constantly discovering new cases and the media report on their development. With a certain amount of optimism we can say that in the fight against corruption, the Czech Republic has experienced a positive shift with regard to punishing the culprits of corruption cases, with first convictions currently emerging. Why is corruption so dangerous? Corruption not only undermines macroeconomic and fiscal stability, causing inefficient use of public funds, but if not timely addressed, it causes growing distrust in the legal system and in the state as such. Despite the work of authors who have come to the conclusion that corruption can have a positive impact on economic growth, the dominant view (supported by a much larger number of studies) is that corruption has a negative effect on growth variables and in turn on economic growth. The aim of this paper is to use dynamic panel regression model to verify the hypothesis of the impact of corruption on economic growth on a sample of OECD countries. To express the perceived level of corruption, we used the index of corruption of PRS Group, which has the advantage of having a much longer history and being more consistent in terms of methodology than compared to the much better known the Corruption Perception Index (CPI) drawn up by Transparency International. Its other advantage is that in case of follow-up studies, it will be able to be used in the future, which in the case of CPI will not be possible due to major changes in its methodology.

Key Words

corruption, economic growth, dynamic panel data estimation, OECD countries

JEL Classification: C23, E60, K40, O11

Introduction

The concept of corruption has been increasingly present in our society in recent years, both in the media, politicians' statements and public presentations of the results of various surveys. It is regarded as one of the major global challenges that must be addressed. Corruption in many forms and mankind have gone hand in hand since time immemorial and understanding of corruption and its severity is significantly influenced

by the culture, the environment in which people live and the values that they profess. These factors and especially the time factors mean that corruption is seen differently.

One of the problems related to corruption is its definition. Neither the international organizations dealing with this phenomenon and the fight against it, have no uniting definition[1]. Also, social sciences perceive corruption in different ways. This obviously has a negative impact on determining the methodology of measuring corruption and subsequent comparison of the results of this measurement. However, we can say that scientists, politicians and economic authorities agree on the negative influence of corruption. At this point it should be noted that, although rarely there are studies highlighting the fact that corruption can have a positive impact on economic indicators [4, 7, 14, 16, 17], they were opposed by the opponents of these theories [5, 25, 26, 30] and, more or less, disproved. Most analysts [5, 6, 20, 21, 25, 30, 33] dealing with this phenomenon concluded that corruption has a negative impact on growth variables, the tax system and its effectiveness [12] and through them also on economic growth.

Increasingly, it appears that the previously somewhat neglected and underrated quality of institutions now plays a major role in the fight against corruption. This article builds on previous studies of its authors dealing with the influence of the institutional environment on the scope of corruption and its determinants [13]. Results confirmed that it is very important to monitor not only the macroeconomic indicators, but also their stability and institutional framework, see Kotlán [9].

The aim of this paper is verify the hypotheses of the negative impact of corruption on economic growth by using dynamic panel regression model. From the point of methodological view the ontological approach will be used, e. g. in Kotlán [10].

The advantage of this analysis, as compared with previous studies, is an extension of the studied period. Empirical work of the authors who analyzed the relationship between corruption and economic growth is mainly dated to the 2nd half of the 1990s, when the issue of corruption was very popular. In this paper the studied period was extended by about 10 – 12 years (i.e. until 2009). Another indisputable advantage is the analysis of a homogeneous sample of countries. Compared to the existing studies, which included in the analysis as many countries as possible, this econometric analysis will analyze a relatively homogeneous group of countries. The analysis will be carried out on a sample of 30 OECD countries due to the relative homogeneity of these countries in terms of their level of development, which ensures good comparability of data obtained. The advantage of the study is the use of dynamic panel regression which, compared to standard cross-country regression, allows capturing all links between the countries in a matrix.

[1] For purpose of this paper, we choose definition of Transparency International (TI), which says that corruption is *"the abuse of entrusted power for private gain"* [31, p. 12]

1. Corruption in growth theories

The theory of long-term economic growth is mainly based on the original neoclassical Solow model [29] and its further extension toward endogenisation of technological progress [18, 27].

The production function usually has the form of Cobb-Douglas function, see, e.g. [23]:

$$Y_t = A\left(v_t K_t\right)^{\alpha}\left(w_t H_t\right)^{1-\alpha}, \tag{1}$$

where Y_t is the total output of the economy; *v* or *w* represent the part of the physical *(K)*or human *(H)*capital, respectively, which is intended for production; *A* represents the level of technology and coefficient α represents level of diminishing returns to physical capital. The sum *(α*+ (1 – *α)* = 1) then expresses the constant returns to scale, which form the basic assumption of the model.

Growth rate of the economy can then be commonly expressed as follows [22, 23]:

$$\gamma = \frac{1}{\sigma}\left(\left[D\left(1-\tau^{K}\right)^{\alpha\beta}\left(1-\tau^{H}\right)^{\beta(1-\alpha)}\left(u+z\right)^{1-\alpha}\right]^{\frac{1}{1-\alpha+\beta}} - \rho - \delta\right), \tag{2}$$

where $D = f(\alpha, \beta, A, B)$.

In the growth equation, τ^K, τ^H represent tax rates on capital and labour, respectively; δ is the capital depreciation rate, coefficient β describes the degree of diminishing returns of physical capital, ρ is the rate of time preference, *u* is the utility function of households, and *z* is the part of physical or human capital, which is dedicated to the accumulation of human capital. *B* also represents the technological coefficient.

Corruption is integrated in the above equation through its effect on individual growth variables, in particular on human capital, technological progress and investment.

Pro-growth factors that play a major role in the growth theories include technological progress and human capital. How can they be affected by corruption? Generally, it can be argued that corruption has a negative impact on these variables, through reducing government expenditure on education, science and research and healthcare.

These issues were specifically addressed by Mauro [21], who dealt with the impact of corruption on government spending on education in his work, concluded that corruption has a significant impact on the size of education spending, the efficiency of its utilization, and hence on human capital, which is usually approximated by the ratio of workforce with at least secondary education. He specifically argues that the deterioration in the perception of corruption by one point (on a scale of 0 – 10] will lead to a reduction in government expenditure on education relative to GDP by 0.7 to 0.9 percentage points.

In their work, Gupta, Davoodi and Tiongson [6] also focused on the impact of corruption on health care and education. Their analysis concluded that corruption affects the productive population, human capital and technological progress through the effect on infant mortality rate and "failure rate" of primary and secondary school pupils. If the perception of corruption drops by one point, it will result in an increase in infant mortality by 1.1 to 2.7 per 1000 live births. In education (training), worsening perception of corruption will lead to an increase in the number of students who will fail to complete the study by about 1.4 to 4.8 percentage points.

The technological advances are also affected by investments. In their work, Murphy, Shleifer and Vishny [25] say that if experts increasingly move from productive sectors to rent-seeking, there is a decline in productive investment. Romer [28] concluded that corruption may affect investment in new products and technologies, especially if these are necessary in the initial stages of development.

Tanzi and Davoodi [31] used the indicator of public investment as a share of GDP, to confirm or refute the hypothesis that higher corruption is associated with higher public investment. Based on the above analysis, they concluded that higher corruption increases the size of public investment while reducing their efficiency, leading to lower economic growth.

As for time preference, no studies have yet been presented that would confirm the exact impact of corruption on this variable; however, we believe that in countries where corruption is high, consumption and investment spending will be postponed due to the need to use funding for corruption practices.

The above suggests that corruption has a negative impact on growth variables, so it is obvious that it will have a negative effect on economic growth as such.

The first empirical works in this area include the study by Mauro [20]; here, based on regression analysis, whose basis is the neoclassical growth model, he concludes that improving the perception of corruption by 1 point (on a scale of 0 – 10] will lead to the growth of gross domestic product per capita by 0.8 – 1.3 percentage points. He subsequently developed this theory in other analyzes, also focusing on other pro-growth variables [21].

In his study of the relations of economic growth and corruption, Mo [24] states that if the perception of corruption drops by one point (on a scale of 0 – 10], in other words, if it deteriorates, it will result in reduced economic growth by 0.545 percentage points. The main factor that affects perception of corruption is political instability, which makes up 53 % of the entire effect.

2. Methodology and data

From a methodological perspective, the work is based on a dynamic panel regression model. Compared to the cross-sectional analyses, the panel regression has multiple

degrees of freedom, with a very important option of including individual effects (i.e. the existence of heterogeneity across cross-sectional units). This makes the presented statistics more credible, given the relatively small number of countries and short time series. The software used was E-Views, version (7). Dynamic panel was used, and generalized method of moments (GMM) was used for estimation, specifically the Arellan-Bond estimator [2]. The below model includes a lag of one period, as is usual in this type of studies [1, 3]. Alternatively, other phases of delay were tested.

Real GDP per capita in USD adjusted for purchasing power parity (RGDP) was therefore the dependent variable. Delayed value of the dependent variable and also the level of corruption measured by the index of corruption of PRS Group (CORRUPTION) were the independent variables. Other variables used in the models include the real investment rate relative to real GDP (RINVESTMENT) and the variable approximating the level of human capital. This is the number of students enrolled in tertiary education in relation to the total population (HUMAN), for more about approximation of technological progress in economic growth theory, see e.g. [4, 7].

In terms of methodology, stationarity tests using the panel unit root according to Levin, Lin and Chu [15], Im, Pesaran and Shin [8] or Maddala and Wu [19] were performed first. Only the level of GDP was found to be non-stationary. Its stochastic instability was removed in subsequent analyses by using first differences, or rather logarithmic differences – d (log RGDP).The estimates employed the model with fixed effects, which is, according to Wooldridge [32], more suitable in the case of macroeconomic data as well in a situation where cross-sectional units are countries.

Much of the data was taken from the OECD database; an additional source was the PRS Group database from which the data on the perception of corruption was also taken. Due to the longer time series, PRS Corruption Index was chosen, as the well-known Corruption Perception Index (CPI) of Transparency International was first published in 1995. Its other advantage is that in case of follow-up studies, it will be able to be used in the future, which in the case of CPI will not be possible due to major changes in methodology.

PRS corruption index is an index of political risk, whose aim is to assess the degree of political stability of a country, which is done by scoring the various factors that may affect this stability. The minimum which can be assigned to each factor is zero, while the maximum value is determined by the fixed weight that is assigned to the given factor within the group. The rule that the higher the score, the lower the political risk they represent, applies to all components (factors). To ensure score consistency, both between countries and over time, points are awarded based on a series of preset questions. The PRS corruption index can reach a maximum value of 6 points, estimating the level of corruption across the political spectrum. Corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment of the country, e.g. through increasing tax quota (Kotlán, Machová [11]), reduces the efficiency of government and business, by allowing persons to have influential positions not on the basis of ability, but on the basis of cronyism; and ultimately it causes inherent instability of the political process and system. Although this index takes into account

bribes which investors can experience in government offices, when granting export or import licenses, during calculation of taxes, lending, etc., it focuses much more on recent or potential corruption in the form of cronyism, nepotism, exclusive employment, secret funding of political parties or suspiciously close relationship between politicians and businessmen. This is because these forms of corruption are considered to be potentially much higher risk for foreign investors and may lead to a general dissatisfaction, inefficient control of state finances and support the development of the black market. The authors see the greatest risk of corruption, however, in the fact that its ubiquity can lead to the overthrow or collapse of the government and subsequently to a general reorganization or restructuring of political institutions or change in the political system.

The period covered includes the years 1985 – 2009 (credible data is not available for a longer period) across 30 OECD countries (i.e. without the new members who joined in 2010)[1].

3. Dynamic panel model for OECD countries

This section describes the estimation of dynamic panel model. For completeness, it should be noted that several variants of models with different lag length of the dependent variables have been examined, and the model with the most convincing results (statistical significance of the model, statistical significance of coefficients and other characteristics).

Tab. 1 Dynamic panel model of GDP for OECD countries (30), 1985 – 2009

Dependent variable	**d(log RGDP)** [2]
Number of observations	611
RINVESTMENT	0.01(3.92)***
HUMAN (-1)	0.02 (0.54)
d(log RGDP(-1))	0.30(1.74)***
CORRUPTION(-1)	-0.01(-1.64)**
Adj. R^2	0.36
F-statistics	25.1***
J-statistics	9.11

Note: Included in parentheses are t-statistics that are adjusted for heteroskedasticity and autocorrelation; standard deviations are calculated using robust estimates, *, **, *** stand for significance levels of 10 %, 5 % and 1 %, respectively; fixed effects method.

Source: own calculations

GMM – Generalized Method of Moments is the method used to estimate the dynamic panel. The Adj. values R^2 and F-statistics are not studied in the software used for dynamic panels (in case of using generalized method of moments); however, these were

[1] These are Estonia, Chile, Israel and Slovenia.

[2] The table shows, in accordance with the definition of the d(log RGDP), individual independent variables, construed as impacting GDP growth rate if they change by one (after being multiplied by a hundred in percentage points).

alternatively estimated in the same model using OLS, which returns inconsistent parameter estimates on the one hand, but on the other hand the relevant coefficient of determination can be taken as a relatively reliable informative indicator of the model's consistency with the data. The validity of the instruments was validated using standard Sargan test (as indicated in the table as J-statistics).

The table shows that the effect of corruption is consistent with economic theory, proving to be negative. Corruption therefore significantly harms economic growth. Other independent variables result with the expected signs, although the statistical significance of human capital was not confirmed.

Conclusion

Exposing corruption, its punishment and precautions preventing its occurrence and effects are a constant topic not only for national governments, but largely also international and non-governmental organizations through the development of various analyzes, monitoring reports, recommendations and designing new tools. The main reason for this activity is the belief that the effects of this phenomenon are the harmful.

Even though some authors argue in their studies that corruption can have a positive effect on economic growth, the opposite view prevails. This is supported by a number of empirical studies that have examined the impact of corruption on investment and other growth-related variables (technological progress, human capital, the size of public expenditure, etc.) and concluded that the economic growth of countries is negatively influenced through these channels.

The present paper builds on previous studies of its authors [13], which dealt with the quality of the institutional environment and the determinants of corruption. This paper aimed to verify these hypotheses concerning the impact of corruption on economic growth. Compared to previously published studies, it is characterized by extending the analysed period by about 10 – 12 years, using dynamic panel regression featuring more degrees of freedom than cross-sectional analyses, including individual factors (i.e. the existence of heterogeneity across cross-sectional units). Another advantage of this analysis is that the sample of countries surveyed, which is characterized by a certain degree of homogeneity in terms of maturity, guarantees good comparability of the data obtained.

The results of the analysis show that the hypothesis of the negative effect of corruption on economic growth has been confirmed and that corruption significantly harms economic growth. All the variables used resulted the expected signs, showing that they acts as foreseen by theory.

The above analysis only confirms the opinions of international and non-governmental organizations that corruption must be fought and that the anti-corruption costs are not a waste of money. If we manage to eliminate corruption, we can expect that this will be reflected not only in certain macroeconomic indicators, better international reputation

of the country, increased attractiveness for potential investors, but also in a better mood in the society.

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Application of the Multi-Project Management in Companies

Abstract

Contemporary companies use as a tool for strategy implementation project management. The problem of this approach is that the number of projects grows; the company must solve parallel projects of various types and priorities. On the other hand the growth of resources is not so remarkable. An effective management of project portfolio consists of three phases: formulation of the framework of portfolio configuration, portfolio design and portfolio management. The portfolio management is also called a multi-project management, concerning variety of activities including portfolio optimizing. The reasons for multi-project implementation are different (advanced globalization, the integration of markets or the development of new technologies). All these factors make great demands on the right implementation of multi-project management. The goals of this article are to analyze activities leading to an effective use of multi-project management, describe steps which are necessary to do for its successful implementation and illustrate the practical use on the example of one company as verification case study, which proved the theoretical background of this topic.

Key Words

multi-project management, project, project management, portfolio, strategy

JEL Classification: G32

Introduction

A number of today´s companies use project management as a tool of the strategy implementation. Thus the number of projects in companies has increased. Companies have to manage projects of various kinds, the structure of which are being more complicated and depend on changed external and internal determinants. Therefore, it is necessary to create portfolios of projects which ensure linkage between strategic goals and projects, sustaining competitive position of the company and growth of its value with respect to limitation of disposable resources. An effective process of project portfolio configuration and management consists of three phases [5]:

- Framework of portfolio configuration and management;
- Portfolio design;
- Portfolio management.

The framework of portfolio configuration and management represent a set of conditions and requests, which are obligatory for the whole portfolio configuration and management process. Generally there are quality standards set in this phase. Among determining conditions aspects of linkage of project and strategy, resources limitation, portfolio balance, used methodology of evaluation are being taken into account.

Portfolio design means the right selection of suitable projects into portfolio. The balance of all types of projects (*Developing Projects*, enhancing the competitive position of the company for the future, *Renewing Projects*, keeping the technology in operation, *Rationalization Projects*, increasing efficiency of operating processes, and *Mandatory Projects*, going out of legislative demands) is necessary to compare with performance criterion and resources limitation. In this way decision about projects, which are included or excluded into portfolio are being met.

Portfolio management is a dynamic process which represents *Portfolio Evaluation*, *Portfolio Restructuring*, and *Portfolio Optimization*.

The Multi-project management contributes to ensuring the relations between strategic goals and firm´s projects, reinforcement of competitiveness and effectiveness of resources allocation. For achieving high performance of the system, the multi project management must be right implemented into the firm´s processes.

The aim of this article is to provide a brief survey about the principles of the use of the Multi-project management in Strategic management processes and to describe changes the company must meet for utilization of its benefits.

1. "Multi-project management" in context of Project Portfolio Management

The historical view of a multi-project management has its relevance. In the economic literature there can be found the first mentions at the end of the 60s. In this time it was concerning the allocation of resources within the mathematical programming [6]. Pritzker, Watters and Wolfe [9] analyze the linear planning in their essay from 1969. Generally, the aspects for the reduction of a project run-time are discussed. The authors look into a scheduling problem. The aim is to set an order of the projects to be able to finish all the projects in the shortest time. This similar task, which can be solved on the mathematical way, is a selection of the projects to reach a maximum of the benefit within the limited investment costs.

Fotr and Souček [5] use bivalent programming for project portfolio optimizing, in case when more resources limitation are given. The basic criterion is that chosen economical parameter must be additive through all evaluated projects (e.g. NPV or profit). Variables can then reach only two values, 1 (the project is included into portfolio) or 0 (the project will be excluded from the portfolio). If the portfolio optimizing will be designed under

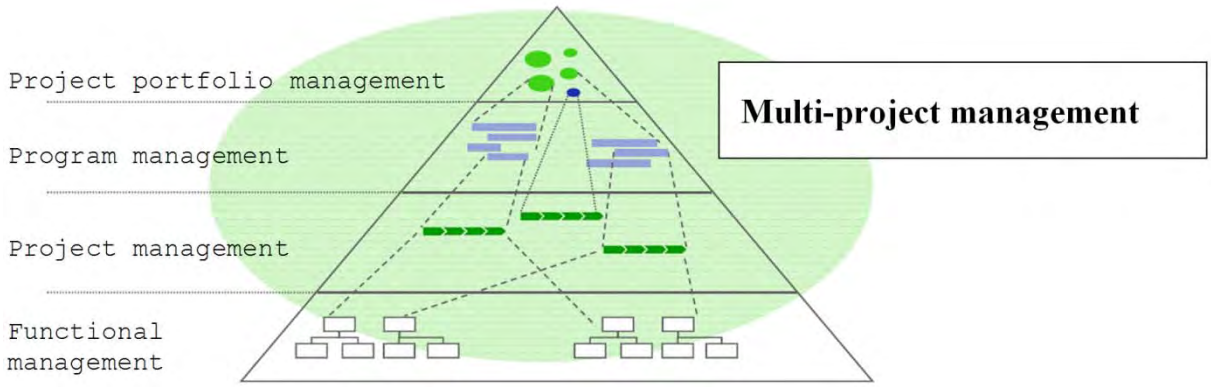
risk, stochastic optimizing methods based on statistical risk characteristics of given parameter are being used. For these methods software aid is necessary.

According to Engwall and Jerbrant [3] the term multi-project management can be used if the main part of activities is realised with the simultaneously running projects and the collective base of resources is used. The project portfolio management (PPM) is a term, which has been used since the 90s of 20th century. From Levine´s point of view [7] the project portfolio management is a collection of processes, which integrate the projects with other company operations. The projects are in accord with strategies, resources and all activities of the company. The processes, which are used by PPM, are according to Project Management Institute the processes of collection, identification, categorization, evaluation, selection, prioritization, balance, acceptance and re-evaluation concerning the components of portfolios (projects and programs) [10].

The authors Pfetzing and Rohde [8] comprehend the meaning of the term "multi-project management" an establishment and a development of more project structures and processes on the strategic and operative level. In the book "Projektmanagement" [1] there is a note, that the multi-project management is also suitable for a controlling of more projects in the organization. The aim is to make use of the synergy effects and to avoid any possible conflicts.

Basically, the multi-project management is a complex management of project environment to reach the defined aims of relevant stakeholders within coordinated effects of organization, strategies, structures, processes, methods and cultures [4]. This issue is clarified in the following figure 1.

Fig. 1 Multi-project management



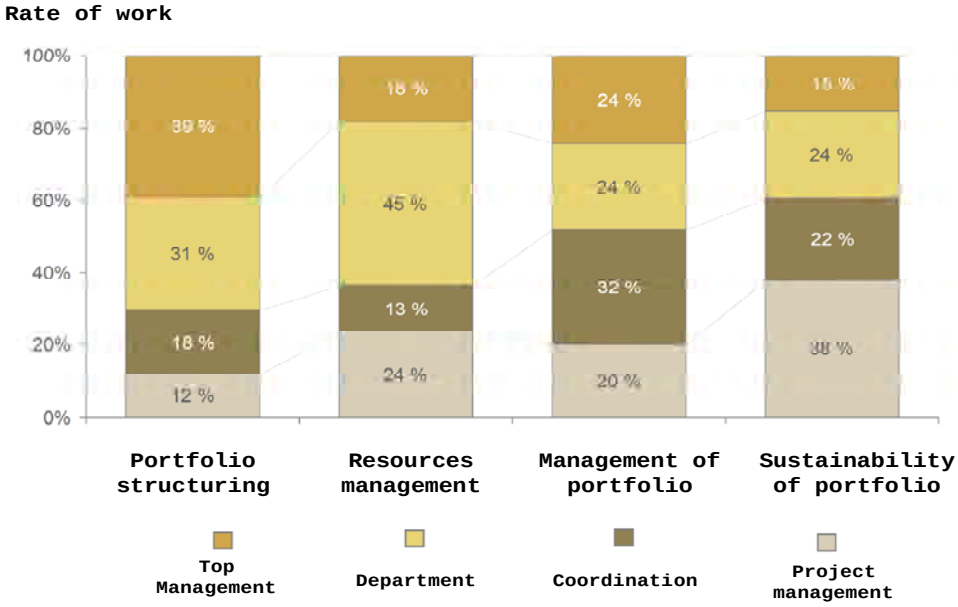
Source: [4]

The praxis has already recognized a need for the multi-project management. In the year 2009 and 2010 a study was performed by the Technical University Berlin [4]. The aim was to find answers for the following questions:

- Which demands are made on the strategy formulation?
- How can the multi-project management be helpful for better implementation of the strategy?

In total there were about 301 participants. The structure was as follows: automotive/engineering (24 %), banking/insurance (18 %), IT (13 %), services (12 %), electric/electronics (9 %), chemicals (5 %), healthcare (4 %), consumer goods (3 %), science (2 %), others (10 %). In all, there were 276 portfolios analyzed, where the average number of projects in the portfolio was 143. The Technical University Berlin is focusing exclusively on the multi-project management. From this reason the number of projects in portfolio was at least 20. The aim of the Technical University Berlin was especially the identification of actual trend of the multi-project management and getting the suitable ratios. In this study there were also activities of the multi-project management analyzed to determine who the main participant is. According to the following figure 2 it can be assumed that the top management is regularly focusing on the portfolio structuring.

Fig. 2 The Role of the Management in the Multi-project Management



Source: [4]

The results of the research have proved the strong correlation between the Strategic management and the management of project portfolio. The main topics connecting the strategy to multi-project management were:

- Stability of strategy;
- Clarity of strategy;
- Conformity of strategy and portfolio;
- Formalization of the project prioritization;
- Evaluation criteria for projects prioritization.

It is undisputed that the top-performers make a systematic analysis of the environment, draw a long-term strategy, and deduce the aims of project portfolio with a view to the strategy.

2. "Multi-project management" implementation

Transformation from the separate project evaluation to systematic project portfolio checking forms the basic change in investment decision and steps of strategy implementation. It is mostly connected with process reengineering, redefinition of criterions creating benefits for the firm and controlling of value drivers correspondence comparing the projects performance and the company´s strategic goals. The effective multi-project management requires more centralized tools of investment decision. Thus the projects inside of the organization are getting competitive. It was proved that effective configuration of the project portfolios and setting the right priorities concerning each project, can be not only helpful for the better realization of the firm´s strategy, but it also diminishes a number of trouble projects. All these facts yield lump-sum savings over approximately 20 – 30 % of investment costs.

To the basic activities preparing the restructuring of the organization to the multi-project management belongs the **process analysis**, which enables to introduce the multi-project management on the operational level, **organizational analysis**, which enables to set the relevant communication lines, **personnel analysis**, which enables to improve the preparedness of project teams. Considerable changes must be done in the **controlling**, which must be more focused on the investment management procedures, project performance monitoring, reporting the portfolio and strategy conformity. The whole organization will become more flexible if introducing the multi-project management.

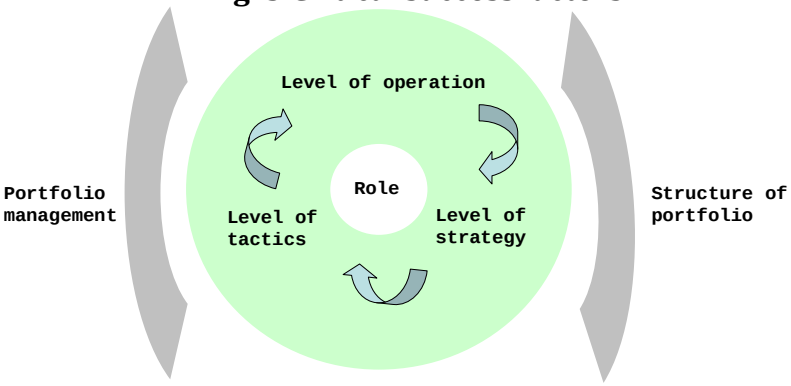
The portfolio creation is also a remarkable tool of risk treatment. Degree of reduction of the portfolio´s risk exposition depends on the portfolio scale (large portfolios contribute to risk decreasing), statistical dependence of projects (negative correlation or non-correlation of projects decrease the risk). The tool of risk exposition estimation used in contemporary praxis is the **stress analysis**, shows key risk factors influence the project portfolio.

Successful implementation of the multi-project management presupposes:

- The strong support of the top management;
- The clear specifying and communication of benefits for the organization and its stakeholders;
- Priority of processes before tools and methods of project evaluation and choice;
- Organizational supports, quality standards setting, build new procedures in the organization´s regulations.

The Technical University Berlin has also defined the critical factors for success of the multi-project management (see Fig. 3). The illustration is as follows:

Fig. 3 Critical success factors



Source: [4]

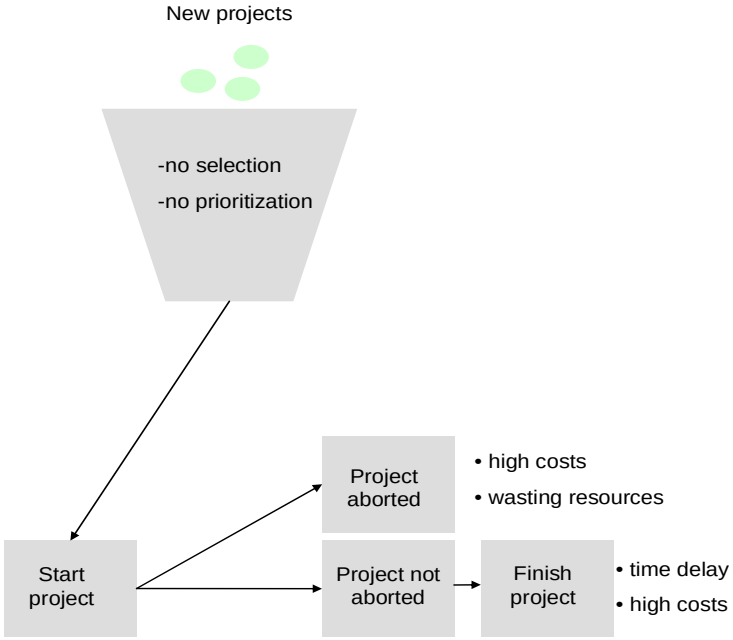
3. Case study: Analysis of Organizational Changes after Multi-Project Management Introduction on example of a specific German Company

The object of the research was a German company, which is specialized on the renewable sources of energy. The annual turnover is about CZK 1.000 mil., and the number of employees is 100. The discussions with the management showed that company had problems concerning performance decrease and raise of costs, which were solved by implementation of the multi-project management. This instrument has been introduced in the year 2006. The goal of the research was to analyze the changes of the project management organization after the multi-project management introduction.

3.1 Situation before 2006

An analysis was performed that showed that the number of projects in the company has been growing very fast since 2000. Further, the projects have become more complicated. On the other way the amount of sources was limited. The growth of projects quantity and their complexity was more rapid in comparison with the resources growth. Until 2006 the formalization of methods and processes was not realized. The projects with similar content were not bundled. Beyond the line organization structure the project organization structure became more important. Successively both types of structures without clear priorities were used for project and organization management. The communication between strategic and project management was poor. Contribution of performed projects to the growth of firm´s value was not monitored. Figure 4 shows the primary project management scheme.

Fig. 4 Project management (before 2006)



Source: own

The above mentioned process of project management was not effective. The main problems were:

- small or no conformity with the strategy;
- no prioritization of projects;
- no identification of the synergy effects among the projects;
- missing and wasting resources;
- low transparence and high costs.

3.2 Situation after 2006

The process of the project management (project portfolio management) was redefined in the year 2006. The goal of reengineering was to reduce the costs and to use the resources more efficiently. The changes were focused on determination of two phases. Firstly, planning and determination of the project portfolio should lead to the constitution of effective projects corresponding with organizational strategy, and secondly, the portfolio will be properly managed with the stress on relevant controlling and reporting the projects procedures.

The process of the multi-project management can be thus divided into two parts – planning and management/controlling. Concerning planning the identification of projects must be done at first. Especially relevancy of accepted projects over the whole portfolio must be checked. The reasons for this are as follows:

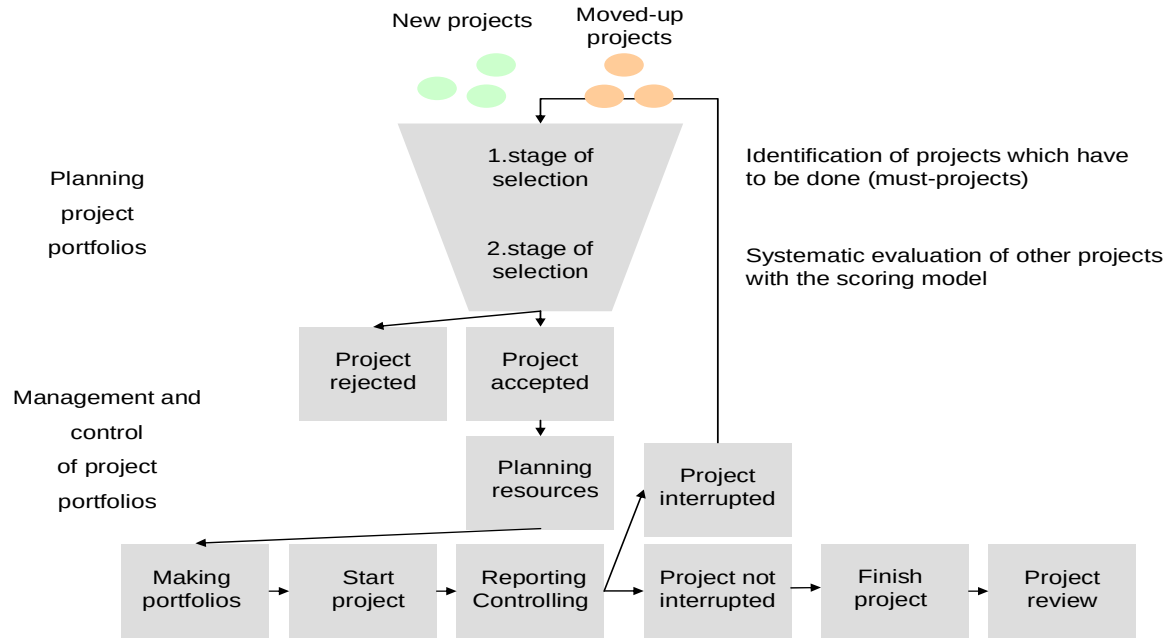
- requirements from the state (authorities);
- closed contracts;

- necessity on the operative level;
- actual results of research and development.

Other projects are evaluated with regard to the strategic and financial benefit for the company. The projects with high benefits are accepted. When the project selection is completed the allocation of resources (human, financial, space) will be done. Subsequently, the project portfolios will be designed. Examples of respected criterions are: similarly content, conformity with the strategy, the same resources, or the same initiator.

The introduction of multi-project management has considerably improved the performance of the company. Conformity of project portfolio with the strategy of the organization has raised the company´s value. The communication within the organization has become more transparent. The progress of project management has become regularly monitored and controlled. In case of discrepancies the project portfolio can be modified and the selected project interrupted. The project review is made for every project. Figure 5 shows the new project management scheme.

Fig. 5 Multi-project management (after 2006)



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Conclusion

The article presents the modern tool of process management – the multi-project management. The advantage of this technique consists in the work with the project portfolios, concerning and optimizing all types of projects that are necessary for company´s performance and competitiveness. It is obvious also that the mastering of the multi-project management contributes to the growth of the firm value. With regard to

the increasing requirements to the management quality the multi-project management can be indicated as a critical factor of success.

The presented study on a case of a specific German company showed that the strategy of this company and the project portfolios configuration were not in a correlation before 2006. The result of this was the performance deceleration and loss of competitiveness. When the implementation of the multi-project management was realized the position of the company has considerably changed. The effective organization of multi-project management is a tool to improve the effectiveness of the strategic management processes in companies that use the project oriented management. Of course, to use this concept effectively the managers must have knowledge about the instruments, methods and processes on the strategic, operative and tactical level.

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Economics as a Social Science Even in the 21st Century?

Abstract

Scientific disciplines undergo development in time. In case of economics, the development is so essential that there is a strong need to exclude it from the category of social sciences, where it had been placed in the past, as well as the creation of an independent group of economic sciences beside the natural and technical sciences. The need to strike out the economic sciences can be proved by a wide range of facts including the timeless validity of several economic principles. As practical illustration the functioning of the capital market has been chosen which can give the evidence that the economic reality provides a limited space to individuals for their subjective decisions unlike as in the case of social sciences thus changing many effects into fatal ones similar to the situation in natural sciences. A great attention has been paid to the creation of an independent group of economic sciences because due to the existing classification of economics as a social science particular subject of the economic life deduce inadequate expectations caused by the improper assumption of possible subjective influences on the economic development. At the same time, it must be emphasized that it is not reasonable to doubt existing relationships between economic and social sciences. On the other hand, links of economic sciences to natural sciences cannot be neglected either. Despite this fact the economic sciences cannot be identified with none of these groups, and this statement refers also to technical sciences. In terms of its subject the economic sciences are so specific for the time being that it is meaningful to separate them from the social sciences, not assign them to any scientific group, and create a new group of economic sciences

Key Words

relationships between scientific disciplines, capital market, interest rate, production function, indifferent analysis

JEL Classification: A12

Introduction

A correct placement of a particular scientific discipline into the system of sciences is an extraordinarily important moment in relation to the expectations of economic subjects [1]. These ask the question, what benefits can bring a particular scientific discipline, how useful can be its application in practice [10]. There will be probably nobody who would have doubts that for instance civil engineering belongs to the category of technical sciences. Then, from this position certain expectations of subjects arise. There will neither be expectations that a family house could be constructed within one day nor that the construction costs could be equal one average monthly salary in a moderately developed economy. At the same time, it can be assumed that the majority of people have no doubts of the placement of law into the social sciences. On the other hand, it can

be expected that based on the social order penalties for certain criminal acts will be made stricter and other ones reduced. In such reality even an acquittal can be assumed for a criminal act which was punished by a stay in prison in the past. The above given contemplation give a certain base for the answer what can a citizen expect from the economics in the framework of the economic development. Until now economics and other economic disciplines have been included into the group of social sciences. There were some doubts in the past, e. g. in relation to the objectivity of the economic principles, nevertheless above all in the former Eastern block, economics was considered „a science dealing with relationships between people during the production process, i. e. with production relationships". This specification corresponds to the Engels's definition of political economic as a science *"…of conditions and forms under which various human societies produced and traded, and where products were distributed…"* [7, p. 156]. This understanding favoured the classification of economics as a social science. It is this aspect of all facts which leads to inadequate non-realistic, even irrational expectations of people. Despite the recession and the decreasing revenues in the economy, people are not willing to accept falling personal incomes, both social allowances and earned incomes. They are supported by arguments of politicians being in opposition during this time period. If economics were considered consequently positioned in the category of economic sciences, and those are not social science in the full sense, a gradual change in the behavior of people could be expected as in the above mentioned case of technical sciences.

In history, it was current to exclude particular sciences from philosophy and to create groups of sciences. Economics in its proper sense neither belong into any of those founded groups nor can be included into one of them without doubts [4]. F. Ochrana in his paper „Metodologie vědy" (Methodology of science) distinguishes physical, social, and economic sciences making a difference between social and economic sciences. In case of economic sciences he shows that due to continuous changes in the capital market all changes of interest rates are different which could be considered as a distinction from the social sciences. However, this cannot be true because in social sciences, for instance, "…*individual health is substantially dependent on the individual „record" in the genetic code, and the same disease can have different impacts at different human beings…*" [8, p. 71]. In terms of the distinction of social and economic sciences, very interesting can be the idea supported by R. Carnap which is based on the difference between a scientific principle and a general statement – K. R. Popper replied to this aspect. He claims that „…*social principles – if even any some real social principles exist – should be valid in general. However, this can mean only one fact – they are related to the whole history of mankind and cover all its time periods, not only selected ones…"* [9, p. 39]. Strictly universal statements "…*are related to unlimited unrestricted areas and to an endless number of cases…According to Popper no social uniformities can exist which would have a duration exceeding the boundaries of the individual periods. That's why in the social sciences, there is an open question, if it can be spoken about the universality and forms of social principles*…" [8, p. 77 – 78]. Let us now ask the following question: if there are no universal principles in social sciences, does it mean that there are no such principles in economics? The answer can be considered definite, because for instance the principle of scarcity is unlimited in time and is valid for all time periods of the human economic activities. The fact, that it was always „valid", can be understood as an argument for the

exclusion of economics from the group of social sciences. Besides, more principles like this one exceeding the boundaries of the existing market economy can be found.

The paper has no intention to contest an intensive bound between economics and social sciences. In the same way, continuously strengthening links of economics to the natural sciences, e. g. to mathematics are undeniable. An adequate picture about the position of economics in the system of sciences can be done by means of particular problems being solved in the economic theory both in the framework of macro- and microeconomics [3], [5], as well as in the theory of globalized world economy [2]. This is the reason why in the following text attention will be paid to a particular microeconomic topic, which is very important in the modern integrating and globalizing economic world, i. e. the capital market. Basically, it will be a more elaborated F. Ochrana's idea concerning the relationship between the reality of the global financial crisis and the functioning of economic sciences and/or economic principles. The following text will try to emphasize the objectivity of the running processes on the example of capital market. The consideration basis is the relationship between the capital demand on the one hand, and the supply on the other, linked with capital appreciation phenomenon in the context of the deferred consumption. The whole process resulted into the investment decision concerning capital savings or in the investments into physical and financial capital in an optimum proportion.

1. Objective Effect of the Capital Market

The specificity of the capital market lies above all in the perspective growth in the sense of its increasing importance on the generally defined markets of production factors taking into account that this facts follows from the interaction between the continuously growing revenues and the marginal trend to savings. This fact has a direct influence on the capital supply. Moreover, the growth of capital supply is in accordance with the growing capital demand in connection with the accelerating innovation movement linked to the R&D development thus demanding an investment growth. The above mentioned links are totally objective when an individual will be considered a subject with rational behavior.

1.1 Capital Demand

In a particular case, the capital demand is a derived demand depending on the marketability of products which were produced by means of this capital taking into account that the marketability is a condition for the revenues from the marginal product (MRP_K), which must be higher than the marginal costs of the capital factor (MFC_K), at the producer's side, and equal the interest rate (r) because otherwise it would not be rational to invest. The capital demand is shown in Figure 1 – Firm in the capital market, and in Figure 2 – Market demand for capital.

Fig. 1 Firm in the capital market

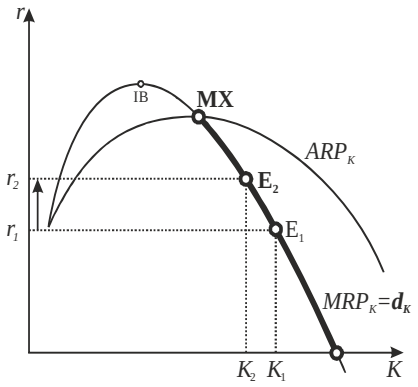
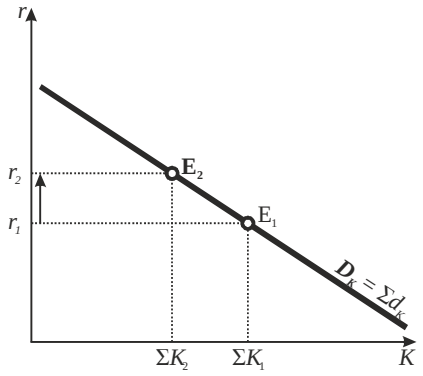


Fig. 2 Market demand for capital



Source: [6, p. 159]

It is possible to note that an economic subject making effort to maximizing his profit to be able to transform it into his benefit cannot ignore these facts which are basically independent on his will. If he acted in any other way it would be the same as violating rules concerning life preservation in medicine thus damaging his health deliberately. A similar situation occurs also in technical sciences. If people wish to have a car with minimum fuel consumption, designers will focus their research in this direction as well as an economist will choose processes how to maximize profit or utility. Experts' methods in both mentioned scientific disciplines will bring effects (ceteris paribus) unlike as in the case of the expert's decision in a typical social science – law, where the abolition of the death penalty need not to influence the number of murders.

1.2 Capital Supply

An analogous conclusion also crystallizes on the side of capital supply. An economic subject makes the choice between the present and future consumption where the possible perspective of the future consumption raised by the interest rate can lead to postponing the present consumption. It is the future revenue flowing to the economic subject from the capitalized savings and their interests. The reality is given by the following formula:

$$S_n = (1+r)^n \cdot S_0 \,, \tag{1}$$

where S_0 represents the current amount of savings and the n index the number of years with interests.

In this context it is to emphasize that economic subjects have only a very limited possibility to influence the size of the interest rates and their dependence on the inflation rate. From the above mentioned facts follows the market capital supply expressed by a growing function where the elasticity of the capital supply varies depending on the time horizon with increasing elasticity in a long-term period.

The real decision of an economic subjects what the size of his savings and the following investments will be can be expressed by the indifferent analysis. It is just this case where

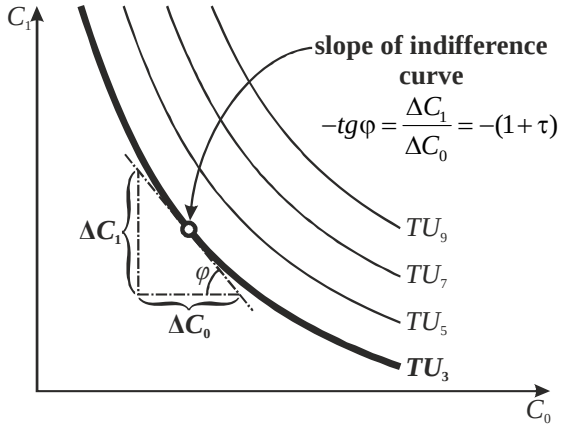
the relationship between economics and social sciences arises explicitly as well as the above mentioned „record" in the genetic code, namely in the individual profiling or in the slope of the indifferent curve distinguishing the individual as more or less saving (economical) one. It can be expected that the slope of the indifferent curves will be more than 45 degrees. The directions of the indifferent curves showing the limiting rate of the time preferences are given by the following formula:

$$\frac{\Delta C_1}{\Delta C_0} = -(1+\tau), \tag{2}$$

where τ is the rate of the time preferences, C_1 is the future consumption, and C_0 is the present one.

See also the Figure 3 – Indifference curves and the marginal rate of the consumer time preferences

Fig. 3 The slope of the indifference curve



Source: [6, p. 162]

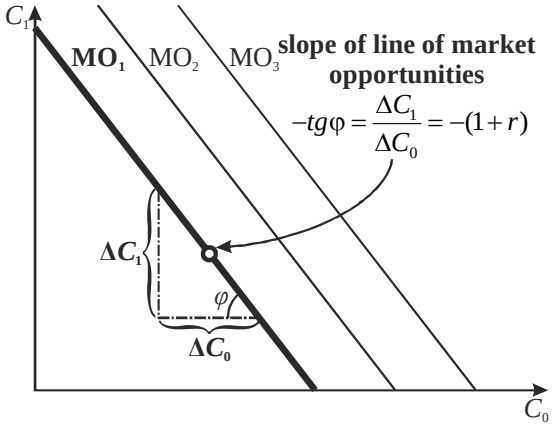
The line of the market opportunities is influenced by the reality of an inter-temporal selection while the sizes of the present and future consumptions are influenced by the possibility to invest savings as financial capital. The future consumption (C_1) is given by the sum of the future revenue and the savings from the present revenue raised by interests. The present consumption (C_0) is given by the sum of the present consumption and credits from the future revenues reduced by interests. Assuming a positive real interest rate the direction of the market possibilities will be always higher than 1 or lower than – 1. It can be given by the formula:

$$\frac{\Delta C_1}{\Delta C_0} = -(1+r), \tag{3}$$

where *r* is the real interest rate and the other symbols have the same meaning as in (2).

See more in Figure 4 – The line of market opportunities and the market interest rate.

Fig. 4 The slope of the line of market opportunities

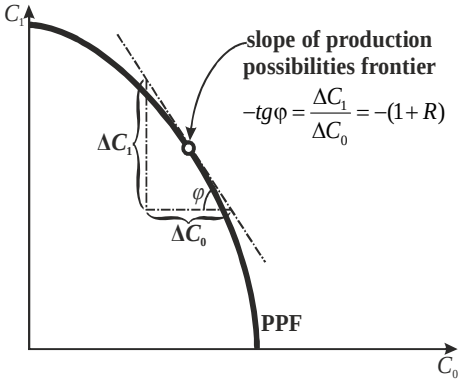


Source: [6, p. 163]

1.3 Production Possibilities Frontier

The production possibilities frontier (PPF) links together an effective combination of present and future consumption which can be obtained in both cases by investments into the physical capital. The direction of the production possibility frontier shows the relationship between the size of the present consumption, which the consumer must give up to be able to invest it into the production, and the size of the future consumption raised by the revenues from this investment. See more in the Figure 5 – Production possibility frontier and the internal rate of return.

Fig. 5 The slope of the production possibilities frontier



Source: [6, p. 164]

The direction of the production possibilities frontier shows how much the future consumption will rise in the given PPF point when the present consumption drops by one unit. This can be expressed by:

$$\frac{\Delta C_1}{\Delta C_0} = -(1+R), \tag{4}$$

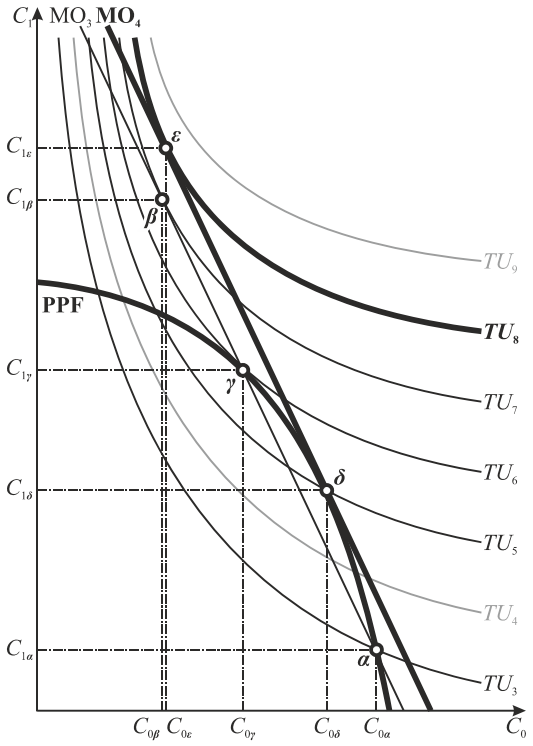
where R is the internal rate of return of the investment.

The optimum for the consumer (investor) lies there where the total utility is maximized.

2. Rational Behavior of an Economic Subject

Now let us discuss the question how a rationally thinking subject will have to act having the possibility to distribute his sources between the present consumption as the first option, to invest into the physical capital on the other hand, and even into the financial capital as the third choice. Such reality, which has no rational alternative in the sense of the process-decision principle, is shown in Figure 6 – Optimizing the consumer decisions for investments into financial and physical capitals.

Fig. 6 Optimizing the consumer decisions for investments into financial and physical capitals

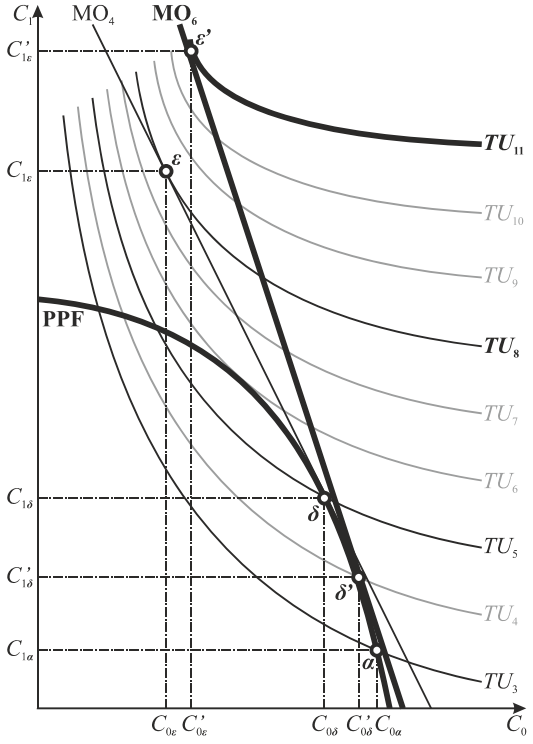


Source: [6, p. 169]

Observing for instance from the α point of the Figure 6, it is obvious that the marginal rate of the consumer time preferences τ is comparatively low and both the internal rate of return of the investment into the physical capital, and the interest rate of the financial capital are higher. Thus, the consumer is motivated toward savings and investments into both the financial and physical capitals. The γ point in the Figure 6 represents the situation when the consumer invests a part of his present consumption, of the size between $C_{0\alpha}$ and $C_{0\gamma}$ into the physical capital and will have a revenue in the form of the future consumption between $C_{1\gamma}$ and $C_{1\alpha}$ thus having an increased utility of TU_6 . The internal rate of return of the investment into the physical capital in the γ point will be equal the marginal rate of the consumer time preferences.

However, even the ϰ point is not an optimum decision because it can be seen clearly that both the marginal rate of time preferences and the internal rate of return of the investment into the physical capital are lower than the interest rate on the financial capital market. The consumer is thus motivated to reduce investments into the physical capital in favor of investments into the financial capital; his personal interests cannot allow him to do anything else. If the consumer reaches the β point (see Figure 6), i. e. when he saves a part of his present consumption of size between $C_{0\alpha}$ and $C_{0\beta}$ and invests it into the financial capital, he will have a total revenue between $C_{1\beta}$ and $C_{1\alpha}$ on the financial capital market, he will obtain a total utility of TU_7 on the MO_3 line of market possibilities, and his marginal rate of time preferences will be equal to the interest rate. The β point is not optimal either because the line of market possibilities is not the highest accessible line referring to investments into the physical capital. Optimal is the decision to invest from the original value of $C_{0\alpha}$ a sum between $C_{0\alpha}$ and $C_{0\delta}$ into the production, i. e. into the physical capital, what the investor actually will do, because this investment brings the consumer a revenue between $C_{1\delta}$ and $C_{1\alpha}$. The consumer will invest into the financial capital his present savings of values between $C_{0\beta}$ and $C_{0\varepsilon}$ to get revenues between $C_{1\varepsilon}$ and $C_{1\delta}$. In the point δ the internal revenue percentage will be equal to the interest rate, and the consumer will obtain a total utility of TU_8 in the point ε where the interest rate corresponds to the marginal rate of time preferences.

Fig. 7 Effect of the market interest rate growth on economic subjects



Source: [6, p. 170]

The fact that economics meets the requirements to be excluded as a scientific discipline independent from the natural and social sciences has been proved in the best way. That was the reason why the whole design of capital market had been realized on the change in the result, following from the Figure 6, after the interest rate growth caused not by the decision of the given subject, but by – as already shown above – the inflation rate

change which is in this case given by “force majeure”. And just these mentioned results are shown in Figure 7 – Effect of the market interest rate growth on economic subjects.

Conclusions

Using the capital market as an example, the presented paper aims to show how intensively the decisions of economic subjects are determined by the objective reality to consider consequently, what is the actual position of economics in the system of sciences. It can be assumed that it is the position itself which influences the expectations of economic subjects that can fall into conflicts with the unfulfilled particular expectations. Unlike social sciences in economic disciplines, the reality cannot be changed according to the wishes of economic subjects. Based on the shown example of capital market, an interest rate leading to a higher benefit level cannot be introduced – see TU_{11} in the Figure 7. Moreover, in the economic sciences, again unlike social sciences, a change cannot happen without impacts (see above mentioned example of law) on the economic principles, at least on some of them, which is the case in natural sciences, and this represents a timeless validity. That’s why in the time being economics should be extracted from the social sciences and a new independent category of economic sciences should be introduced.

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Innovation Industry Drivers

Abstract

Competitiveness of the economy of a country or region is determined by the extent of its ability to implement innovations. Not every industry, however, is a strong industry in terms of innovations, an innovative driving force; therefore there seems to be evidence to suggest that the level of innovation and consequently the level of economic competitiveness correspond to certain industrial structure, specifically to the dominance of the relevant "drivers".

The aim of this paper is to compare the selected countries by their level of innovation, using the results from the Global Innovation Index from the point of view of the industry structure and evolution of gross domestic product per capita; to try to find an answer to the question of whether highly innovative countries differ in the industrial structure from innovation "retarded" countries and simultaneously to evaluate the position of the Czech Republic.

To fulfil its objective, the research was divided into three parts: determining the degree of correlation between the level of innovativeness of the country and its performance as measured by gross domestic product per capita; applying the SHA-DE model to determine the positions of the industry in terms of their share in gross value added and growth rate with a sample of selected countries; determining the concentration ratio of the studied groups of the industry in this group of countries.

The analysis confirms that it is non-innovative economies that focus on the industries of agriculture, hunting, forestry and fishing, while economies with the highest level of innovation focus on the "J-P" industries according to ISIC 3.1. The conclusion also serves as a background to formulate general recommendations for the Czech economy.

Key Words

industrial structure, innovative industry, innovative regions, SHA-DE model

JEL Classification: O25, R11

Introduction

The industry structure of an economy is subject to changes that reflect a society´s progress with its technical-technological, social and economic aspects. However, the changes in the industrial structure of economy are usually initiated by innovative trends; on the other hand, they may represent higher order innovations by Valenta classification [10].

Innovation, inducing according to J. A. Schumpeter a dynamic imbalance reality as the basis of economic growth and social development, are generally considered to be a

source of increasing competitiveness [9], [7]. Innovations can also determine the industrial structure of economy of the country or region with an important "purifying element" from the state of economic recession; a moment that re-starts the lost growth momentum. In the long run, changes in the industry structure are a determinant of social development as they induce – both positive and negative – reactions and consequences for the society as a whole. In order to implement such changes in the industrial structure that support the growth and development of a region, or a country, it is essential to identify those industries that have a significant positive impact.

Currently, there exist several industry groups defined by a significant pro-growth character. In particular, these are the so called high-tech industries which – similarly to individual companies [6] – characterized by:

- the level of workers with a university degree in the industry exceeds the average in the country,
- expenditure on R & D in the industry exceeds the average in the country,
- growth of revenues for services and own products or, as the case may be, more precise indicator of growth in book value added of the industry exceed the average in the country.

According to the UN SITC Rev. 4 Classification, these include in particular: Aerospace, Computers-office machines, Electronics-telecommunications, Pharmacy, Scientific instruments, Electrical machinery, Chemistry, Non-electrical machinery, Armament [8]. In connection with the development of the knowledge economy and the processing of methodology to evaluate it (Knowledge Assessment Methodology, KAM) [3] examined are also the so-called knowledge-intensive industries, often with penetrations to high tech industries. E.g. EUROSTAT classifies knowledge-intensive services (KIS) as: i) total knowledge-intensive services, ii) knowledge-intensive market services (excluding financial intermediation and high-technology services), iii) knowledge-intensive high technology services; for high-technology classification of the manufacturing industry it uses classes according to their technological intensity: i) high-technology, ii) medium high-technology; iii) medium low-technology and iv) low-technology manufacturing [2]. However, innovative industries are characterized by the so called high road strategy, which is based on achieving competitive advantages by implementing innovations, unlike those industries that have not left the basic strategic direction of reducing costs (low road strategy).

The aim of this paper is to compare the selected countries according to their degree of innovativeness, using the Global Innovation Index (GII) evaluation results in terms of development of the industry structure and development of the gross domestic product per capita; try to find an answer to the question of whether highly innovative countries differ in the industrial structure from innovation "retarded" countries and simultaneously to evaluate the position of the Czech Republic in that sense.

1. Innovative Industries in Strategic Documents of the EU and the Czech Republic

Strategies for growth and development of the EU and the Czech Republic both emphasize the issue of competitiveness in a global world. Europe is suffering from structural problems that manifest themselves in an insufficient degree of innovativeness with which issues are linked both of the level of targeted allocation of financial resources and the level of education and use of information and communication technologies. In terms of support to industrial innovation "drivers", two initiatives are particularly significant, namely the "Innovation Union" and "An Integrated Industrial Policy for the Globalization era" [1]. One of the main weaknesses identified in the Czech economy is its lack of diversification *"resulting from the lack of support to its innovation capacity and corporate research and development"* [11, p. 7]. As a consequence, the Government of the Czech Republic states that in order to increase competitiveness, the governmental measures may be *"aimed to support individual industrial entities or industries and also they may affect the overall structure of this segment."* For those who refuse the increase in regulatory measures and increase in the extent of redistribution processes, the government then adds that the steps "must not distort competition" [11, p. 14]. At the same time, however, it should be stressed that the government in its strategy to the year 2020 characterizes the Czech Republic as a heavily industrialized country (compared to the EU average) and also considers this orientation as a *"determinant for the years to come"* with concomitant necessary increase in the size of *"sophisticated production using innovation and new technologies."* It can be deduced from the contents of this major strategic document of the Czech Republic that the aim of the government is to carry out industrialization of our industrialized country on a higher qualitative level, despite economically developed countries tend to increase the share of the gross domestic product and employment in the tertiary industry. It is as if the reproof to the tertiary industry in relation to its lower labour productivity as compared to industry, which resounds in the document, did not consider the factual distinction of services from material goods production.

2. Methodology and Results

To fulfil its objective, the research was divided into three parts: i) determination of the degree of correlation between the extent of innovativeness of the country and its performance as measured by gross domestic product (GDP) per capita, ii) application of the SHA-DE model to determine the positions of the industry, or of statistically recorded group in the industry, both in terms of their share in gross value added (GVA), and the rate of growth for a sample of selected countries; iii) determination of the concentration ratio of the studied groups in this group of countries.

To determine the degree of innovativeness, The Global Innovation Index was used based on the approach published by the European Institute of Business Administration (INSEAD) and World Intellectual Property Organization (WIPO – a specialized agency of the United Nations). One thing we need to mention here is that this is not the similar

named concept offered by The Boston Consulting Group. The report on the GII has been processed annually since 2007, and for 2012 it contains data on 141 economies, thereby covering about 94.9 % of the population and about 99.4 % of the world GDP. Global Innovation Index is a composite indicator to assess individual economies in terms of their inclination to innovation and innovation outputs. In order to improve the information value, the model is annually optimized. The whole principle of compiling the GII indicator consists in averaging sub-indices. GII itself consists of Innovation Input sub-index and Innovation Output sub-index. Innovation Input sub-index covers areas of Institutions, Human capital and research, Infrastructure, Market sophistication and Business sophistication. Innovation Output sub-index then focuses on the Knowledge and technology outputs and Creative outputs. In total, GII can be decomposed into up to 84 key indicators [4].

The industrial structure of economies is characterized by seven industry groups in a way used by UNSTAT in its global statistical reports, i.e. corresponding to International Standard Industrial Classification of All Economic Activities, Rev. 3.1 (ISIC) [12]. The paper analyses data of GII 2012 reflecting the results of 2011, therefore, GDP and GVA were used from 2011, in case of the GVA industry growth the annual growth between 2011 and 2010 was taken into account [4], [12], [13].

2.1 Innovativeness and Performance of Economies

In order to determine the relationship between the GII valuation and the amount of GDP per capita [13] all 141 countries for which the GII indicator is calculated were subjected to correlation analysis. Based on the Spearman correlation coefficient ($\rho = 0.8743$) was a significant relation between GII and per capita GDP (at current prices). Test of significance of the correlation coefficient also showed the reliability of this relationship at the 99% confidence level.

2.2 Application of the Modified SHA-DE (Share – Development) Model

A sample of countries under examination was created for further analysis. On the basis of GII 2012, 6 most (Switzerland, Sweden, Singapore, Finland, United Kingdom and Netherlands) and 6 least (Togo, Burundi, Laos, Yemen, Niger and Sudan) innovative economies in the world were chosen. Moreover, due to the interest of authors, the survey also included the Czech Republic, as the 27th economy of the world in terms of innovativeness. The selected countries in descending order according to the value of GII and their codenames, which are then used in the presentation of results, are shown in the Table 1.

The selected countries were analysed in terms of the industrial structure of their economies (according to the ISIC 3.1 classification), based on the GVA structure (at current prices), and the growth of these industries. The SHA-DE model was modified that in its basic form operates with two levels for the share and growth (high-low). For

finer resolution, the model was developed as three-level. The matrixes are divided into 9 industries; the horizontal axis captures the share of the industry in the national economy in 2011, with levels up to 10 % (low), 10 to 20 % (mean) and over 20 % (high share); the vertical axis shows the rate of growth of the industry between 2010 and 2011 with levels: decline, to 10 % growth and over 10 % growth.

Tab. 1 Countries under examination

Country name	Switzerland	Sweden	Singapore	Finland	United Kingdom	Netherlands	Czech Republic	Togo	Burundi	Laos	Yemen	Niger	Sudan
Country code	CH	SE	SG	FI	GB	NL	CZ	TG	BI	LA	YE	NE	SD
GII 2012 rank	1.	2.	3.	4.	5.	6.	27.	136.	137.	138.	139.	140.	141.

Source: authors' work, based on [5].

The results are presented according to the division into seven groups in Fig. 1 to 7. All highly innovative countries show very low shares (2.9 % at most) in the creation of GVA in industries of Agriculture, hunting and forestry; Fishing (ISIC A, B). In contrast, we find shares to be much higher in the innovation-retarded economies, with Togo showing the highest share (47 %). With its 2.2 %, the Czech Republic ranks among the highly innovative countries. A slight year-on-year decline was observed only in the Netherlands; in all other countries we have observed differently intensive growth patterns.

In the industry of Mining and quarrying; Electricity, gas and water supply (ISIC C, E), we can observe division of innovation-retarded countries in half. While Laos, Sudan and Yemen show shares from 12 to 25 %, the other three countries show low share of these industries in the creation of GVA, like all highly innovative economies and the Czech Republic. Higher growth rates can be found in the group of innovation-retarded countries.

Of all the seven groups under examination, rating of countries in the Manufacturing industry (ISIC D) is most diverse, individual countries are placed in seven out of nine fields. Noteworthy are positions of the Czech Republic, it shows in the industry not only a high share, but also one of the highest growth rates. Highly innovative countries are grouped mainly in the range of mean share, innovation-retarded countries in the range of low share.

Shares found in the Construction industry (ISIC F) are low and rarely balanced at the same time; all thirteen countries are grouped in the range from 2.8 to 6.8 %. Growth figures are much more differentiated, from the ten-percent decrease (Sudan) to almost forty-percent growth (Laos). Growth of the Czech Republic reaches less than one percent.

In the industry of Wholesale and retail trade; Hotels and restaurants (ISIC G, H), all highly innovative countries are grouped in the growth intervals of mean share values, including the Czech Republic. Contrarily, innovation-retarded countries are markedly differentiated in this indicator, both in terms of share and growth.

Fig. 1 Matrix A, B industry

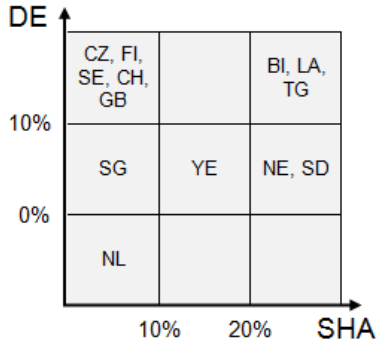


Fig. 2 Matrix C, E industry

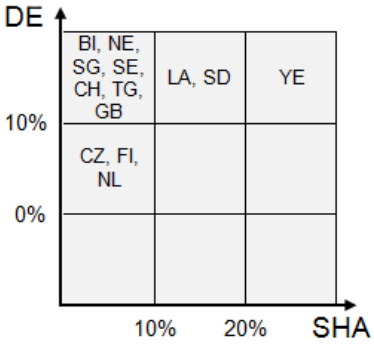


Fig. 3 Matrix D industry

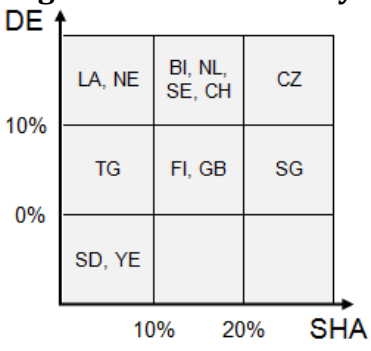


Fig. 4 Matrix F industry

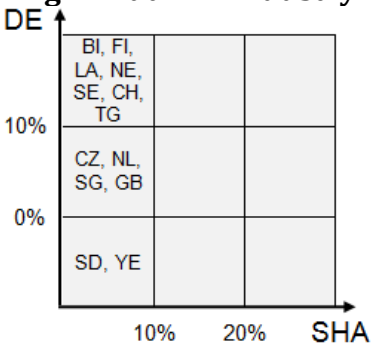


Fig. 5 Matrix G, H industry

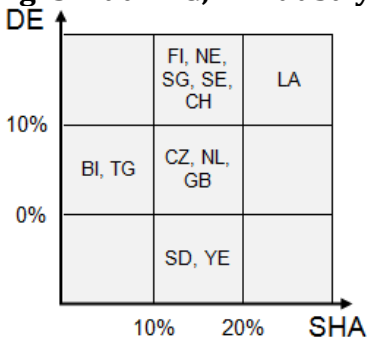


Fig. 6 Matrix I industry

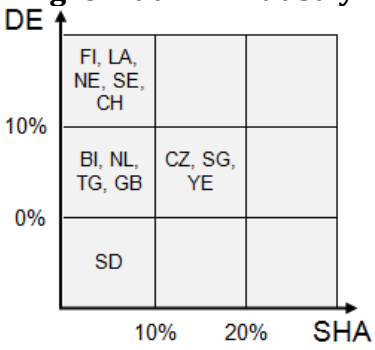
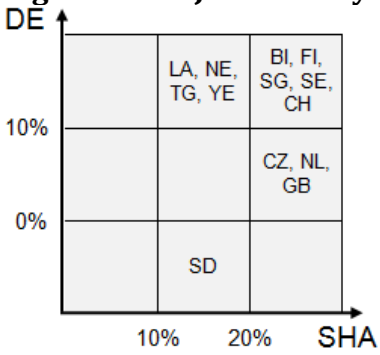


Fig. 7 Matrix J-P Industry



Source: authors' calculations

In the industry of Transport, storage and communication (ISIC I) all the countries under examination exhibit aligned shares between 6 – 13 %. Neither in terms of share nor growth can significant differences be identified between highly innovative and innovation-retarded economies.

Other Activities (ISIC J-P) include industries: Financial intermediation; Real estate, renting and business activities; Public administration and defence, compulsory social security; Education; Health and social work; Other community, social and personal service activities; Activities of private households as employers and undifferentiated production activities of private households. Statistically, a broad-based group has, as expected, high share values. With highly innovative countries in the range 41 – 51 %, innovation-retarded countries 16 – 28 %. The Czech Republic with its 36 % share can be

found in the middle of these two groups of countries. Sudan is declining, the Czech Republic, the Netherlands and the United Kingdom show a moderate growth, while the other countries show a higher growth (over 10 %).

2.3 Sectoral Concentration and its Relation to the Degree of Innovativeness of the Economy

In addition to assessing the degree of share and growth of individual groups of industries in the sample of countries, the degree of concentration of industries in studied groups was evaluated, being quantified using the regional industry concentration index (I_{RC}) – expressed by equation (1). On one hand, it compares the performance of an industry of the country against the total (herein global) performance of the industry, and on the other hand, the share of the performance of the country against the total output of the whole (world in this case). The performance indicator is GVA.

$$I_{RC} = \frac{GVA_R^I / GVA^I}{GVA_R / GVA_T}, \tag{1}$$

where *GVA* – gross value added; *R* – region (here country); I – industry; *T* – total (here world).

I_{RC} values equal to one represent a situation in which the share of the performance of a regional industry in the performance of the whole industry corresponds to the share of the performance of the region in the performance of the whole. If the value of I_{RC} exceeds the value of 1, then the region (country) concentrates in the industry to a greater extent, corresponding to the index value, and vice versa, I_{RC} values below the value of 1 indicate a relative undersizing of the region in terms of the industry.

Tab. 2 I_{RC} values of pursued countries in 2011

	CH	SE	SG	FI	GB	NL	**CZ**	TG	BI	LA	YE	NE	SD
ISIC A. B	0.2	0.4	0.0	0.7	0.2	0.4	**0.5**	10.7	8.3	6.5	2.6	9.8	7.92
ISIC C. E	0.3	0.6	0.2	0.5	0.8	0.9	**0.9**	0.9	0.3	1.7	3.3	1.1	1.80
ISIC D	1.1	1.0	1.2	1.0	0.6	0.8	**1.4**	0.5	0.8	0.6	0.4	0.3	0.47
ISIC F	1.0	1.0	0.7	1.2	1.2	0.9	**1.2**	0.6	1.1	1.1	1.0	0.5	0.73
ISIC G. H	1.3	1.0	1.3	0.9	1.1	1.1	**1.0**	0.6	0.4	1.5	1.3	1.0	0.97
ISIC I	1.1	1.2	1.7	1.3	1.2	1.1	**1.5**	0.9	1.0	0.7	1.8	0.9	1.31
ISIC J-P	1.1	1.1	1.0	1.1	1.2	1.2	**0.8**	0.4	0.6	0.4	0.4	0.5	0.37

Source: authors' calculations, based on [13].

The resultant data of the examined sample, captured by the Tab. 2, show the two clear conclusions:

- non-innovative economies are focused on industries A, B;
- economies with the highest degree of innovativeness are focused on industries J-P.

In relation to the Czech reality it should be noted that although the degree of focus on industries A, B corresponds to innovative countries, the degree of focus on industries J-P does not correspond with them any more. Certain lagging behind in this regard may be the cause of the lagging behind in innovativeness of the Czech Republic, i.e. its 27th position in the GII 2012 ranking.

The I_{RC} assessment outcome clearly shows the relative industrial balance in terms of the degree of focus in highly innovative countries with a lower level of focus on sectors A, B, but contrarily a high focus of non-innovative countries just on industries A, B. On the contrary, although industries J-P are represented in non-innovative countries, but usually in about half the degree of focus than is the case of innovative economies.

Conclusion

Innovativeness of the economy – the ability of positive change, where the human factor endowed with invention and intuition plays an essential role – is determined by its competitiveness and performance. The above indicated is also confirmed by a high degree of correlation between GII and GDP per capita. The economy of each country or region is distinguished by a sectoral structure, while not every sector is equally strong in terms of innovation.

The modified model SHA-DE was used to analyze sectoral structure of the sample of selected countries. The analysis showed that agriculture, forestry, hunting and fishing are among the innovatively weak industries; mining, energy and construction industries are also among the sectors whose share in the performance of the economy of innovation-strong countries is not critical, although even these economies have recorded a growth – especially in the energy industry. The manufacturing industry is a very specific sector, which is in terms of the share in the performance of the economy underdeveloped in innovation-retarded countries, moderately developed – with the exception Singapore – in innovation-strong economies, with the growth being medium to high there. In this respect, the Czech Republic has a specific role – being a moderately innovative economy – with its high share and high growth of the manufacturing industry. A certain differentiation between the countries of the both groups is reflected in the service sector related to trade, hotel industry, transport and communication; on the other hand, the group of industries, including for example education, health and social work, shows high values of the shares and rather higher growth in all countries; the innovative ones reach roughly twice the share in the performance of the economy in comparison to the innovation-retarded countries. These partial conclusions are also collectively reflect in the results of the assessment of the regional concentration ratio, which shows that non-innovative economies focus on the industries of agriculture, forestry, hunting and fishing, while economies with the highest level of innovation focus on industries "J-P" according to ISIC 3.1.

From the aforementioned facts, the following can be inferred for the Czech Republic: unless we want to lose our competitiveness as compared to the innovative leaders , we should leave the one-sided focus on increasing the share and growth of the

manufacturing industry, but we should, at simultaneous growth of manufacturing industry, emphasize industries of the so-called innovation "drivers", represented by industries in the J-P group, which includes the sector of development and management of human resources.

Acknowledgements

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Application of Fuzzy Numbers in Binomial Tree Model and Time Complexity

Abstract
Discrete binomial models are powerful tools for options valuation. For simple pay-off options they can be viewed as an approximation of famous Black-Scholes option valuation formula. By increasing the quantity of periods in binomial model (i.e. decreasing the length of the period), the results converge to the continuous model. However this approximation is very computationally costly, thus the analytical solution to the valuation is preferable. Nevertheless, the analytical solution does not exist for more complicated pay-off options. In the article we assume the valuation of project with the possibility to change the quantity of products produced. Some input parameters (concretely the volatility and initial cash-flows) are assumed to be uncertain and stated as a fuzzy numbers. Illustrative example is provided in the paper. In this example we examine the time complexity of the algorithm and the influence of the imprecision of input parameters on the appraisal imprecision. From the results it is apparent that the complexity of the model is quadratic. Thus by increasing the quantity of periods in the binomial model it becomes unreasonably time demanding.

Key Words
finance, valuation, investment analysis, fuzzy sets, real options, binomial model

JEL Classification: C63

Introduction

For project valuation the real options methodology could be considered as a generalized approach encompassing both the risk and flexibility aspects simultaneously. The papers and books focused on the real options valuation are for instance [3, 6, 11, 12, 16].

For options valuation one can utilize both the discrete models (binomial or trinomial trees) and analytical continuous version, based on famous Black-Scholes model [1]. For simple European options the value can be stated analytically. However, for American options, exotic and real options with complicated payoff functions the numerical approximation in the form of discrete models has to be applied.

While for the real options the analytical valuation formula usually could not be found, these models are solved mostly by discrete methods. It is also sometimes impossible to state input parameters as the real numbers. Thus, these models are in the paper assumed as a fuzzy-stochastic (in line with [18]). Therefore hybrid (fuzzy–stochastic) binomial option model will be utilized in this paper. We can find a few papers dealing

with fuzzy binomial models methodology approaches. There is supposed a fuzzy volatility (see [8, 9, 13, 14]) or simultaneously fuzzy volatility and fuzzy risk-free rate (see [7]). While the stochasticity of the underlying variables is connected to the risk, the fuzzy approach allows us to work with some vagueness and uncertainty.

In this paper we assume the real investment project under the flexible switch options methodology similar to [17]. This means, that in each moment the project can be switched into another state, in which the underlying asset (resp. free cash flow) changes. These changes are charged by the switch costs (which can be actually negative, i.e. profit).

The goal of the paper is to propose hybrid (fuzzy–stochastic) binomial option model for project valuation and determine the time complexity of the valuation algorithm. The paper proceeds as follows. In the next section the methodology utilized for valuation of a project with switch costs is defined. Then, in the second section the illustrative example is provided and time complexity of the valuation algorithm is examined on this example.

1. Methodology

Valuation of the project is usually based on discounting free cash-flows obtained during its lifetime. The free cash-flow (henceforth FCF) in particular year can be obtained as a net profit plus depreciation of the long term assets minus investments and change of net working capital. Since it is usually difficult to forecast the free cash-flows to distant future, the valuation is usually divided into two phases: (i) in the first phase the cash flow is projected for each year, (ii) in the second phase the cash flow is assumed to be stable or growing by a steady rate. The valuation on the basis of net present value is then as follows,

$$V = \sum_{t=1}^{T} \frac{FCF_t}{1+r} + \frac{FCF_T}{r\left(1+r\right)^T}, \tag{1}$$

where FCF_t is the free cash-flow in year t and r is the required rate of return[1].

1.1 Project valuation with random free cash-flows and switch costs

The formula (1) is the simplest way how to appraise the project based on its predicted free cash-flows. The problem occurs, when we add the flexibility to the project (such as below described possibility to switch to the increased/decreased state of the production). Then discrete models, such as a binomial model, should be utilized.

[1] For the sure FCF the risk-free rate should be utilized. For risky FCF (in this case the mean of the FCF is assumed) the rate taking into account also the risk should be utilized (Risk Adjusted Cost of Capital).

In the previous model (1) the free-cash flows cannot be influenced by the entrepreneur. Assume now that the entrepreneur can change the quantity of goods produced. Thus we assume states which correspond with the utilization of production capacity (e.g. normal state, increased production state and decreased production state). Then in each period the entrepreneur can choose if he stays in actual state or switches to the other state. This change is connected with expenses, so the matrix of switch costs $\mathbf{C} = \left[c_{i,j} \right]$ should be defined. Costs $c_{i,j}$ are one-time costs needed to switch from state *i* to state *j*).

With some simplicity we can divide the free cash-flow into three parts: (i) variable part of the free cash-flow dependent on some random variable such as a price of the product, inputs etc., (henceforth variable income, x), (ii) stable part of the free cash-flow (e.g. fixed costs, henceforth fc) and (iii) above defined switch costs $c_{i,j}$. We assume that x follows geometric Brownian motion.[1] The project can then be appraised by means of binomial tree model with one risk (random) factor. The model is of discrete version and for the sake of simplicity an intra-interval continuous compounding is applied.

There are several ways how to calibrate the binomial model (see e.g. [2, 5, 10]). In this paper we apply the approach of Cox et al. [5]. In this model the indexes of up (down) movement u (d) are computed from volatility σ and the chosen period length τ as follows,

$$u = e^{\sigma\sqrt{\tau}}, \tag{2}$$

$$d = e^{-\sigma\sqrt{\tau}}. \tag{3}$$

The other approaches with very illustrative algorithms can be found e.g. in [4].

In our model the variable income $x(s,t,n)$ at period t assuming $t-n$ increases and n decreases and in the state s would be as follows,

$$x(s,t,n) = x_{0,s} \cdot e^{(t-2n)\sigma\sqrt{\tau}}, \tag{4}$$

The project value at the end of the first phase T is computed as the perpetuity of free cash-flows in the second phase,

$$V(s,T,n) = \frac{x_{0,s} \cdot e^{(T-2n)\sigma\sqrt{\tau}} - fc}{r}, \tag{5}$$

where n is the quantity of decreases of variable income, T is the chosen number of periods with length τ, r is the required rate of return for one period. During the first phase the project value is computed by means of the backward recurrent procedure

[1] If the price of the product follows geometric Brownian motion then also the sales follow geometric Brownian motion.

thought the binomial tree, so that the value at time t and with n decreases can be expressed as follows,

$$V(s,t,n)=\max_i\left[\begin{array}{l} x_{0,s}e^{(t-2n)\sigma\sqrt{\tau}}-fc-c_{s,i}+p\dfrac{V(i,t+1,n)}{1+r}+ \\ +(1-p)\dfrac{V(i,t+1,n+1)}{1+r}\end{array}\right], \tag{6}$$

where $V(s,t,n)$ is the value of the project after t periods and with n decreases and p is calculated risk neutral probability.

1.2 Project valuation with random free cash-flows and switch costs under fuzzy inputs

In this section the volatility σ and also initial variable incomes $x(s,0,0)$ for particular states will be assumed to be a fuzzy numbers (fuzzy sets). Fuzzy sets, firstly introduced by Zadeh [15], are the extension of classical set theory. While in the traditional sets the object either is or is not belonging to the set, in the fuzzy theory there is a membership function $\mu_{\tilde{A}}(x)$ which specifies the degree with which the x belongs to the fuzzy set $\tilde{A}$. Thus, fuzzy set can be utilized to express and handle vagueness or impreciseness mathematically.

The membership function $\mu_{\tilde{A}}(x)$ can possess various shapes. The most commonly utilized fuzzy numbers are those with triangular shape, i.e. triangular fuzzy numbers. Triangular fuzzy number $\tilde{N}$ can be defined as a triplet (l,m,n) with the membership function $\mu_{\tilde{N}}$ as follows,

$$\mu_{\tilde{N}}(x)=\begin{cases}0 & for\ x<l \\ \dfrac{x-l}{m-l} & for\ l\le x\le m \\ \dfrac{n-x}{n-m} & for\ m<x\le n \\ 0 & for\ x>n\end{cases}, \tag{7}$$

where l, m, n are real numbers such that $l<m<n$. Also some properties of the fuzzy sets can be defined such as the support, width, nucleus, height etc. Important tool is α-cut,

$$\tilde{A}^{\alpha}=\left\{x\in X\,\middle|\,\mu_{\tilde{A}}(x)\ge\alpha\right\},\ \forall\alpha\in[0,1]. \tag{8}$$

Below the model from section 1.1 will be updated. The volatility σ and the initial variable incomes $x(s,0,0)$ are assumed to be fuzzy numbers. The numerical computation is made by means of the α-cuts. Assuming $\tilde{\sigma}$ as a fuzzy set of volatility and $\tilde{x}_{0,s}$ as a

fuzzy set of initial variable cash flow, the previous formulas should be changed as follows,

$$\tilde{u}^{\alpha}=\left[u^{\alpha-},u^{\alpha+}\right],\ \tilde{d}^{\alpha}=\left[d^{\alpha-},d^{\alpha+}\right],\ \tilde{p}^{\alpha}=\left[p^{\alpha-},p^{\alpha+}\right], \tag{9}$$

$$\tilde{x}^{\alpha}\left(s,t,n\right)=\left[x^{\alpha-}\left(s,t,n\right),x^{\alpha+}\left(s,t,n\right)\right] \tag{10}$$

$$\tilde{V}^{\alpha}\left(s,T,n\right)=\left[V^{\alpha-}\left(s,T,n\right),V^{\alpha+}\left(s,T,n\right)\right] \tag{11}$$

$$\tilde{V}^{\alpha}\left(s,t,n\right)=\left[V^{\alpha-}\left(s,t,n\right),V^{\alpha+}\left(s,t,n\right)\right] \tag{12}$$

where,[1]

$$u^{\alpha-}=e^{\sigma^{\alpha-}\sqrt{\tau}},\ u^{\alpha+}=e^{\sigma^{\alpha+}\sqrt{\tau}},\ d^{\alpha-}=e^{-\sigma^{\alpha-}\sqrt{\tau}},\ d^{\alpha+}=e^{-\sigma^{\alpha+}\sqrt{\tau}}, \tag{13}$$

$$p^{\alpha-}=\frac{1+r-d^{\alpha-}}{u^{\alpha-}-d^{\alpha-}},\ p^{\alpha+}=\frac{1+r-d^{\alpha+}}{u^{\alpha+}-d^{\alpha+}} \tag{14}$$

$$x^{\alpha-}\left(s,t,n\right)=\min\left[x_{0,s}^{\alpha-}\cdot e^{(t-2n)\sigma^{\alpha-}\sqrt{\tau}},x_{0,s}^{\alpha-}\cdot e^{(t-2n)\sigma^{\alpha+}\sqrt{\tau}}\right] \tag{15}$$

$$x^{\alpha+}\left(s,t,n\right)=\max\left[x_{0,s}^{\alpha+}\cdot e^{(t-2n)\sigma^{\alpha-}\sqrt{\tau}},x_{0,s}^{\alpha+}\cdot e^{(t-2n)\sigma^{\alpha+}\sqrt{\tau}}\right] \tag{16}$$

$$V^{\alpha-}\left(s,T,n\right)=\frac{x^{\alpha-}\left(s,T,n\right)-fc}{r},\ V^{\alpha+}\left(s,T,n\right)=\frac{x^{\alpha+}\left(s,T,n\right)-fc}{r} \tag{17}$$

$$V^{\alpha-}\left(s,t,n\right)=\max_{i}\left[\begin{array}{l}x^{\alpha-}\left(s,t,n\right)-fc-c_{s,i}+p^{\alpha-}\dfrac{V^{\alpha-}\left(i,t+1,n\right)}{1+r}+\\+\left(1-p^{\alpha-}\right)\dfrac{V^{\alpha-}\left(i,t+1,n+1\right)}{1+r}\end{array}\right] \tag{18}$$

$$V^{\alpha+}\left(s,t,n\right)=\max_{i}\left[\begin{array}{l}x^{\alpha+}\left(s,t,n\right)-fc-c_{s,i}+p^{\alpha+}\dfrac{V^{\alpha+}\left(i,t+1,n\right)}{1+r}+\\+\left(1-p^{\alpha+}\right)\dfrac{V^{\alpha+}\left(i,t+1,n+1\right)}{1+r}\end{array}\right] \tag{19}$$

2. Application

In the paper the simple application is assumed. We assume the project characterized by four possible states with corresponding annual variable incomes stated as a triangular fuzzy numbers: (i) normal state $(95,100,105)$, (ii) the decrease of production $(70,75,80)$, (iii) the increase of production $(120,125,130)$ and the closure of the project with crisp number 0. The volatility of variable income (σ) is also stated as fuzzy number $(0.09,0.12,0.15)$. Switch costs between the states are as shown in Tab. 1. The fixed costs are assumed to be 75 p.a. for first three states and 0 after the closure. We assume the rate of return r to

[1] These equations should hold: $u^{\alpha-}\cdot d^{\alpha-}=1$, $u^{\alpha+}\cdot d^{\alpha+}=1$, $p^{\alpha-}\cdot u^{\alpha-}+(1-p^{\alpha-})\cdot d^{\alpha-}=1+r$, $p^{\alpha+}\cdot u^{\alpha+}+(1-p^{\alpha+})\cdot d^{\alpha+}=1+r$.

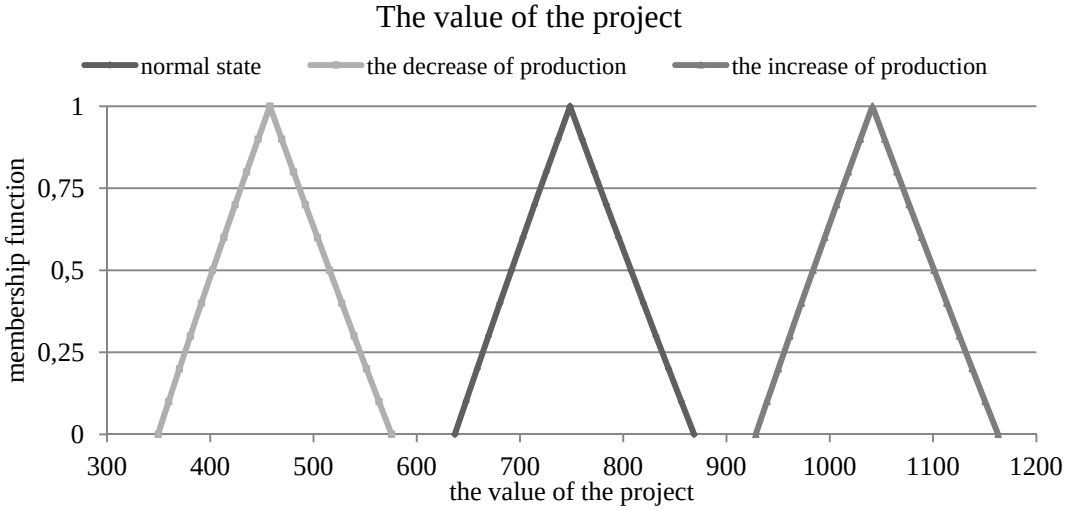
be 7 % p.a. and the length of the first phase T to be 10 years. At the second valuation phase the constant free cash-flows are assumed. The first phase was divided into 512 periods and the project was appraised by means of the methodology described in section 1.2.

Tab. 1 Switch costs

State	**Normal**	**Decrease**	**Increase**	**Closure**
Normal	0	-225	300	-450
Decrease	300	0	600	-225
Increase	-225	-450	0	-675
Closure	∞	∞	∞	0

Source: own calculation

Fig. 1 The project fuzzy valuation for particular initial states



Source: own calculation

The resulting fuzzy numbers are (due to the multiplication operations) not ideal triangular shapes, but are very close to triangular numbers (see Fig. 1). We can conclude that the resulting valuation in terms of triangular fuzzy numbers are: (i) in normal state (636.9, 748.4, 868.6), (ii) the decrease of the production (349.3, 457.6, 575.5), (iii) the increase of the production (928.3, 1041.3, 1163). It can be seen that differences of valuation between particular states are approximately equal to the switch costs between these states. This is predictable, because the state of the project can be switched in the time of valuation. If we compute with the precise input parameters we will get the appraisal as a single number, (i.e. 748.4, 457.6 and 1041.3 respectively for particular states). But while we are uncertain about the precise value of input parameters also the results are not precise. We know that the project appraisal is in computed intervals. These intervals are stated as the α-cuts (the more uncertain we are, the lower α). For 0-cut the intervals are (636.9, 868.6), (349.3, 575.5) and (928.3, 1163) for normal state, increase and decrease of production respectively. We can see, that the uncertainty in value of the variable cash-flow ± 5 and of the volatility ±0.03 cause the uncertainty of the appraisal approximately ± 115. The same interpretation can be done for different α-cuts. See the Tab. 2.

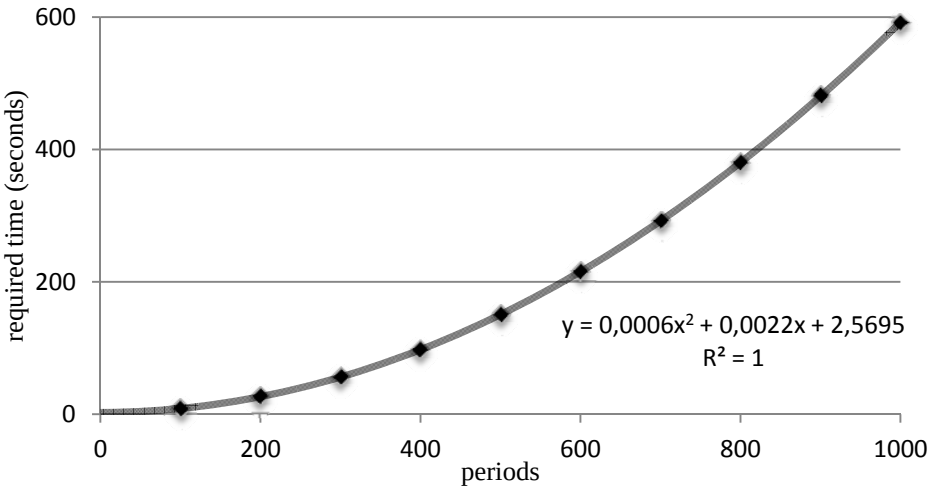
Tab. 2 Imprecision of valuation in dependence on input data imprecision.

α-cut	$\pm x_{0,s}$	$\pm \sigma$	$\pm V(1,0,0)$	$\pm V(2,0,0)$	$\pm V(3,0,0)$
0	5.0	0.030	115.8	113.1	117.4
0.1	4.5	0.027	104.3	101.9	105.6
0.2	4.0	0.024	92.7	90.6	93.9
0.3	3.5	0.021	81.1	79.3	82.1
0.4	3.0	0.018	69.5	68.0	70.4
0.5	2.5	0.015	57.9	56.6	58.6
0.6	2.0	0.012	46.3	45.3	46.9
0.7	1.5	0.009	34.8	34.0	35.2
0.8	1.0	0.006	23.2	22.7	23.5
0.9	0.5	0.003	11.6	11.3	11.7
1	0.0	0.000	0.0	0.0	0.0

Source: own calculation

The valuation algorithm was run on the PC with Intel Core i5 CPU (only one core was utilized) and RAM 8 GB (DDR3, 1333 MHz) for different quantity of periods in the first phase. The times needed to appraise the project are depicted in Fig. 2.

Fig. 2 Time complexity for fuzzy-stochastic project appraisal algorithm



Source: own calculation

As can be seen the time complexity of the algorithm is clearly $O(n^2)$, i.e. quadratic time complexity. The valuation in the case of 1,000 periods (i.e. the period length τ equal to approximately 3.7 days) takes 10 minutes of the processor time. If we decrease period length τ to the one day (i.e. 3,653 periods) the time needed for computations will increase to 2 hours and 14 minutes. In order to come even closer to the continuous valuation, if we decrease the period length τ to the one hour interval (i.e. 87,660 periods), the time needed for computations will increase to 53 days. This is unreasonably huge amount of time needed for calculations. Thus, it can be concluded that this discrete approximation is very time consuming. Some parallelization of calculations should be introduced.

Conclusion

Appraisal of the project as a real option is flexible and useful way encompassing both the risk and the flexibility simultaneously. Both the continuous version and discrete version (i.e. the binomial and trinomial trees) are useful tool for real option appraisal. In this paper we focused on the binomial tree model.

Since it is difficult to state the input parameters precisely, we assumed that the part of the projected free cash-flows and volatility are stated imprecisely as fuzzy numbers. The project appraisal is then also stated as a fuzzy number. Under this approach it can be studied how the initial uncertainty about the input parameters influences (the uncertainty of) the appraisal.

Simple example of the project with three different states and also the closure possibility was provided. The project was appraised as a real option under fuzzy input parameters. For different α-cuts (the different levels of uncertainty of input parameters) the intervals of appraisal was provided. It was shown that the initial impreciseness of input parameters is reflected in the imprecision of the appraisal.

It was found that the time complexity of the appraisal algorithm is quadratic. This means that with the increase of periods quantity (i.e. decrease of period length) the time needed to appraise the project increases with the second power. It was found out that time demands for appraisal with the standard PC is still reasonable for 3,653 periods (2 hours and 14 minutes). By utilizing more periods the computation time demands become unreasonable (for 87,660 periods the required computation time is approximately 54 days).

The proposed appraisal algorithm was not programmed for parallel computations. Thus, further research should be made to consider possibilities of the parallelization. In accordance with the presence of multi-core processors the parallelization should decrease the time needed for computations (i.e. the possibility to increase the quantity of periods for the same computation time).

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The Impact of Institutional Quality on Regional Innovation Performance of EU Countries

Abstract

One of the key attributes of a competitive economy is the ability to innovate. This ability depends not only on technological progress and capital, but also on the environment in which innovations are implemented. There are significant differences in national economic performance among states and there exist even bigger differences at the regional levels. The differences are influenced by innovation potential or more precisely by innovation performance of individual nations or regions which are evaluated within the EU through regular reports of the European Innovation Newsletter. Activities leading to innovations are costly and very risky. Companies are therefore looking for stable environment for their activities. Stable environment can be provided by quality institutions, which includes: conditions for starting a business (so-called start-up), clear and transparent rules when dealing with public administration, investor protection, tax burden, low corruption, competence of public administration and its integrity, equal access to information etc. Nevertheless, the main stream economy ignores more or less the influence of institutions and abstracts transaction costs, thus getting trapped when it is unable to explain why traditional instruments and approaches of neoclassic economy in development schemes often do not contribute to sustainable development. An analysis of selected institutional quality indexes – Doing Business and Corruption Perception Index – and the regional innovation performance index – Summary Innovation index – showed significant effect of these indexes on the innovation performance of countries and therefore regions.

Key Words

innovation, institutional quality, doing business, corruption

JEL Classification: O31, O43, R11, O57

Introduction

Institutions are the key building block in constructing a competitive and innovative economy. The innovative economy is not a static model, but it represents a dynamic system that is changing constantly and that has to develop as fast as the hi-tech industry. Institutions form juridical and regulatory frame for economic competition, enterprise, business and innovations. The purpose of this article is to prove the impact of institutional quality, illustrated by particular indexes, on regional innovation performance. The first part will provide the methodology of measuring overall innovation, whilst the second part will introduce two indicators of institutional quality and its methodology. The last part will compare these indexes and scores together, show

the results for EU 27, analyze them and confirm or refute the relationships between these variables.

1. Innovation

Experts regard the ability to innovate as the key factor of long term sustainable economic competition not only in countries but also in individual regions. Innovation environment depends to certain extent on entrepreneurial environment, which represents overall external conditions in which a company makes its activities. It includes not only a legislative and support frame of enterprise, but also human resources, knowledge and information, size and structure of local economy, socio-cultural and natural environment etc. Creation and implementation of modern strategies and instruments of economic development require an operation analysis, continuous monitoring of regional innovation systems, as well as studies of factors that influence this process. For instance, Šimanová and Trešl [11] perceive the quality of innovation environment as the key factor of the embedding of direct foreign investment in the region. This not only reduces risk investment outflows, but also increases significantly regional non-price competitiveness.

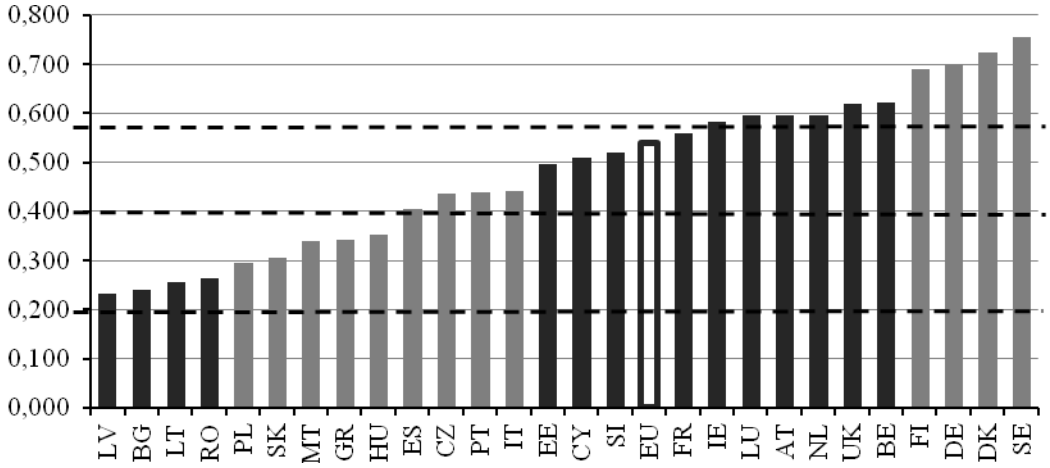
Innovations arise as a result of coordinated investments in know-how, human resources, infrastructure and corporate capital. They require cooperation of the government, university and corporate sector at the state and regional level. Innovations were defined and classified by many authors, e.g. Schumpeter [9], Drucker [3], Schwab [10], Valenta [14] etc. The ability to support and develop innovation is a prerequisite for sustainability and growth of economical performance. According to World Economic Forum (WEF), only innovations can increase the standard of living in the long-term point of view [10]. There are significant differences in national economic performance among states and there exist even bigger differences at the regional levels. The differences are influenced by innovation potential or more precisely by innovation performance of individual nations or regions which are evaluated within the EU through regular reports of the European Innovation Newsletter. It was first published by the European Innovation Scoreboard (EIS) in 2000. A major tool for international comparison of innovation environment and performance in EU countries is Summary Innovation Index [6].

Summary Innovation Index (SII) consists of 24 coefficients that are ranked into three main groups (activators, company activities and outputs) and eight categories. Based on Summary Innovation Index, there are evaluated innovation sources (human resources and funds), innovation activities of companies (investment, innovation outputs, registered patents etc.), and results in innovation (volume and percentage of implemented innovations, employment in industries with high added value etc.) According to SII, countries are divided into: (see Figure 1)

- **innovation leaders** (e.g. Sweden, Denmark, Finland, Germany)
- **innovation followers** (e.g. Austria, Belgium, France, Ireland, Luxembourg) whose innovation performance is above the EU average

- **average innovation countries** (e.g. the Czech Republic, Greece, Italy, Spain, Portugal, Slovakia)
- **catching-up countries** (e.g. Bulgaria, Latvia, Lithuania, Romania)

Fig. 1 Innovation performance of European countries according to SII 2011



Note: Innovation performance of leaders is at least 20 % higher than EU-27 average; innovation performance of followers fluctuates between –10 % and +20 % of EU-27 average; average innovative countries show the value between –10 % and +50 % of EU-27 average; catching-up countries are below 50 % of EU-27 average.

Source: [6, p.12]

Parallel with the evaluation of national innovation performance there appeared some tendencies to evaluate EU regional innovation performance. Since some data were not available, the evaluation was restricted to NUTS2 regions. **Regional Summary Innovation Index (RIS)** differs in structure from the national innovation index because the regional data for all indicators are not available. **RIS** was based on seven indicators that included human resources in science and research, participation in lifelong learning, public and corporate expenditures on science and research, employment in the area of medium and hi-tech production and services, and, finally, on the number of patents registered by the European Patent Office EPO. In 2009 innovation performance evaluation of NUTS2 regions was processed based on 16 out of 24 EIS indicators. This evaluation followed the European Regional Innovation Newsletter 2009 and presented the following conclusions [4]:

- In the regional innovation performance, there are significant differences not only among countries but also within these countries. The most heterogeneous countries are the Czech Republic, Spain and Italy.
- The highest number of innovation regions is in the most innovative countries.
- Regions show different strengths and weaknesses in all evaluated groups of indicators (innovation sources, corporate activities and innovation outputs).
- Regional innovation performance is relatively stable and does not change.
- According to the innovation performance index, the regions are classified into five groups: regions with high performance, with medium-high performance, with average performance, bellow average performance and low performance.

The regional level of innovation performance has a major impact on the economic growth of each country as well as on creating and implementing related strategies whether it concerns regional, industrial, scientific research or educational strategies that are related to the current existing paradigms. These highlight the role of regions when raising competitiveness by means of developing regional clusters, regional innovation systems, regional competitive advantages, regional know-how centers etc.

Although innovations represent a major aspect of successful corporate development in the long term, activities leading towards innovations are expensive and very risky. Companies therefore tend to look for **stable environment**. Such environment can be ensured by quality institutions among which there belong: conditions for setting up a business (so-called start-ups), clear and transparent rules for dealing with public administration authorities, investor protection, tax burden, low corruption, public administration authorities competency and integrity, equal access to information etc.

For example, according to the long-term research "**Politics and Regional Growth**" of BAK Basel Economics (specializing in international regional comparison), innovation strategies should concentrate on general conditions framework rather than on innovative company micromanagement. This means they should concentrate on institutional quality as, for instance, regulation burden and its impact on the innovation ability of economy [5].

2. Institutions

The concept of **institution** is most often defined as a certain set of rules in a society, or institutions are seen as specific organizations. Rules are both written, defined clearly in particular in the legislative system, and unwritten thus reflecting the behavior of individual market players. These rules affect business and legislative environment, law enforcement and also quality and standard of living in individual countries.

However, the question is why deal with institutions and their quality in economic issues such as growth, development, innovation, etc? Institutional economists use the elementary paradigm "Growth and development depend significantly on current valid institutions" [15. p.11] as their platform. As Robert Fogele and Douglas C. North, who were awarded 1993 Nobel Prize for economy, in their works stated, a mere technological change cannot explain increased productivity and economic growth. Institutions together with technology determine transaction and transformation costs that represent total production costs [8]. The absence of institutional stability raises both producer and consumer costs. Ownership rights are elementary part of each institution: their contents together with implementation costs. These rights are fundamental determinants that clarify growth and development. Nevertheless, the main stream economy ignores more or less the influence of institutions and abstracts transaction costs, thus getting trapped when it is unable to explain why traditional instruments and approaches of neoclassic economy in development schemes often do not contribute to sustainable development. Instead, they lead to strengthening economic

differences among global and national regions without supporting welfare and stability equally.

Of course, the new institutional economy faces many problems as well. One of the most important problems is the difference between formal and informal institutions: although formal rules result from political or legal decisions and thus can be changed in a very short time, informal restrictions are based on folk customs, tradition, culture or behavioral code, and they can hardly be changed. Formal rules implementation depends on their compatibility with current informal rules. That is why **institutional quality** can be defined as evaluation of the level and function of observed institutions. This evaluation is carried out by numerous international organizations by using many indexes and indicators that focus on partial aspects and rank the countries. Currently, there are many approaches to measuring and evaluating the quality of institutions, i.e. the institutional environment which can be used to characterize the influence of institutions on growth performance and competitiveness of the economy [1] [7].

For the purposes of this article, the basic soft data index **CPI (Corruption** Perception **Index)** was chosen, which measures a subjective opinion of managers on corruption, and hard data index **DB (Doing Business),** which is based on the analysis of how the institutions supporting enterprise work. This index uses objective analytical methods. The indexes were chosen because of their complexity and direct impact on business environment in the particular countries.

3. Institutional Quality Indexes

Corruption reduces a country's credibility for foreign investors, reduces efficient use of sources and economic performance. It intensifies moral deterioration of society and, especially in transitive economies, it makes a cardinal problem that has a negative impact on operation of businesses entities.

Transparency International defines corruption as "the abuse of entrusted power for private benefit" [12]. **Corruption Perception Index (CPI)** focuses on corruption in the public sector, where government officials, public officials and politicians are involved. Research focuses on bribing civil servants, bribery in public procurement, or embezzlement of public funds. Further, the impact and effectiveness of anti-corruption measures in the public sector are monitored.

In general, corruption comprises illegal conduct, and so it is difficult to evaluate the absolute level of corruption based on hard empirical data (e.g. the amount of bribes paid, the number of prosecutions) – these data rather talk about the quality of the legal and judicial system. Therefore, surveys are the source of data, detecting views of business representatives and experts in the given country, while it may be residents of the surveyed countries as well as foreign experts.

CPI 2011 evaluates the degree of perception of corruption in 183 countries, based on 17 sources of data from thirteen independent institutions. On a scale of 0 – 10, where 10

indicates a country with almost no corruption and 0 means a high level of corruption TI considers rating lower than 5 points as **rampant corruption**. Among the least corrupt countries in the world in the last assessment in 2011 there ranked New Zealand (9.5), Denmark and Finland (9.4).The lowest rating was reached by North Korea and Somalia (1.0) [14].

DB Doing Business Index is a project of the World Bank and it provides practical and specific information about the operation of the business environment and about the costs and administrative demands that are associated with running a business. Monitored parameters of the individual areas are assigned weights which contribute to the value of sub-indicators. Using the defined methodology, the ranking of all countries within each indicator is created. The average order of these sub-indicators creates the overall ranking of all surveyed countries, while a country's order means its index value at the same time. Countries with low index values are the best. To calculate **Doing Business Index 2012** there were used the following sub-parameters:

- **conditions for starting a business** – this includes all procedures necessary for setting up a business activity based on a model example of a business or manufacturing company with more than 50 employees and a simple ownership structure (this evaluates the number procedures, time, costs and financial aspects)
- **difficulty of obtaining building permission** – there are recorded all procedures that construction company must complete in a model example if it wants to build a ware-house (the number of procedures, time, costs for obtaining a building permit)
- **obtaining electricity connection** – the previous test case of the construction of a ware-monitors the number of procedures, days and financial costs required for obtaining electrical connections
- **ownership registration** is evaluated according to the number of procedures, days and financial costs required for the sale of a property between two businesses and the transfer of property rights
- **possibility of getting a loan** – legislation power index, index of credit information
- **protection of investors** assesses the strength of the minority investors protection against the misuse of corporate activities by managers for their enrichment (transparency of transactions, responsibility of managers for their own operations and the ability of shareholders to sue managers)
- **tax burden** – the number, the time for preparation and completion of tax returns, the share of the overall tax burden on gross profit
- **trading across borders** – documents, costs and time connected with exports and imports → **efficiency of courts in resolving commercial disputes** – procedures, costs and time for settling commercial disputes
- **declaration of insolvency** replaced the previously used closing a business. It monitors the time (in years) for which creditors get paid and the financial costs of insolvency proceedings (according to the costs and the rate of funds return that claiming entities can obtain from the insolvent companies).

4. Relationships between Summary Innovation Index, Doing Business Index and Corruption Perception Index

In Table 1 there are recorded indexes SII 2011, CPI 2011 and DB 2012 (data from 2011) for European Union economies. The economies with a high innovation capability are also among the economies with the low level of corruption perception and these economies also occupy the leading positions in terms of ease of doing business. On the other hand, the countries with easy business and the high level of corruption (Lithuania and Latvia) also belong to the under-innovating countries. The exceptions are Portugal and Spain which belong to the average innovating countries although, based on the indexes, these are easy business economies with the lower level of corruption.

Tab. 1 Indexes SII, CPI, a DB in EU (2011)

Country	SII 2011	CPI 2012	DB 2012	Country	SII 2011	CPI 2012	DB 2012
AT	0.895	7.8	10	**IT**	0.441	3.9	73
SE	0.755	9.3	13	**PT**	0.438	6.1	30
DK	0.724	9.4	5	**CZ**	0.436	4.4	65
DE	0.700	8.0	20	**ES**	0.406	6.2	44
FI	0.691	9.4	11	**HU**	0.352	4.6	54
BE	0.621	7.5	33	**GR**	0.343	3.4	78
UK	0.62	7.8	4	**MT**	0.34	5.6	102
NL	0.596	8.9	31	**SK**	0.305	4	46
LU	0.595	8.5	56	**PL**	0.296	5.5	55
IE	0.582	7.5	15	**RO**	0.263	3.6	72
FR	0.558	7.0	34	**LT**	0.255	4.8	27
SI	0.521	5.9	35	**BG**	0.239	3.3	66
CY	0.509	6.3	36	**LV**	0.230	4.2	25
EE	0.496	6.4	30				

Note: Summary Innovation Index and Corruption Perception Index are presented in their value, and in the case of DB index the value is represented by the order of 183 countries evaluated.

Source: [2] [6] [12], own processing

The statistical analysis of these indexes consists of two steps. At first their mutual correlations were evaluated – see Table 2.

All three pairs of the variables are not independent, as P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level which was used for all the tests. To analyse particular pairs, DB has a negative correlation with the other indexes. The better position in DB that any state has (i.e. the lower the value of DB), the greater inovation capability exists (it means a greater value of SII). And the higher position in DB any state has, the better level of corruption perception appears there (it means a greater value of CPI). Indexes CPI and SII are positively correlated – the bigger the innovation capability, the better the level of corruption perception.

Tab. 2 Correlations SII, CPI, DB (2011)

	SII_11	CPI_11	DB_11
SII_11		0.8695	-0.6526
		(27)	(27)
		0.0000	0.0002
CPI_11	0.8695		-0.6909
	(27)		(27)
	0.0000		0.0001
DB_11	-0.6526	-0.6909	
	(27)	(27)	
	0.0002	0.0001	

Note: First row = Correlation. Second row = (Sample Size). Third row = P-Value

Source: own calculation

Then a linear regression model was built with SII as a dependent variable and CPI and DB as independent ones. It means

$$SII = \beta_1 + \beta_2 \cdot CPI + \beta_3 \cdot DB. \tag{1}$$

The estimated parameters are:

Tab. 3 Estimates of Regression Parameters

Parameter	Estimate	P-Value
β_1	0.0611	0.5862
β_2	0.0728	0.0000
β_3	-0.0007	0.4791

Source: own calculation

It means that parameters β_1 and β_3 are not statistically significant as their P-value is greater than the significance level alpha = 0.05. So they will be excluded from the model. It is a corollary of the correlation of DB and CPI stated above. The recalculated model has a general form

$$SII = \beta \cdot CPI \tag{2}$$

where the estimate of β is

Tab. 4 Estimates of Regression Parameters

Parameter	Estimate	P-Value
β	0.0781	0.0000

Source: own calculation

Thus SII = 0,0781·CPI. The R-Squared statistic equals 97.217 %, so the model as fitted explains more than 97 % of the variability in *SII*.

Based on the regression analysis, a significant statistical dependence of SII on CPI and DB was demonstrated. The detailed analysis showed, however, that in the model with three variables, where the dependent variable is the SII again and the independent variables are CPI and DB, the level of corruption proves to be relevant to the innovation, whereas DB dropped out of the model.

Conclusion

Quality business environment expressed by Doing Business Index and Corruption Perceptions Index determines the innovation capability of the country, with the effect of corruption has proved most. Firms in the countries with rampant corruption do not spend their resources effectively, but they use them to search for additional annuity, which ultimately reduces the innovative performance of the given region. Innovations are a prerequisite for the competitiveness of the economies. One of their basic building blocks is the institutional quality. Corrupt environment thus leads ultimately to lower competitiveness of the countries and regions themselves. It follows that corruption is not only an ethical problem, but it has a far-reaching impact on the economic and innovation performance which was proved above. Economic policy makers should therefore adopt such measures that will reduce corruption. One of the most effective means in the fight against corruption is transparency of decision-making processes at all levels of public administration and regulation of lobbying. Further research may focus on a comparison of the traditional EU members with new members, and the influence of other institutional factors on the innovation process in developed and emerging economies.

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The Resilience of Regions to Economic Shocks

Abstract

In view of the latest economic developments all over the world, the question of the economic resilience of regions in the broadest sense has arisen. Existing tendencies towards integration and globalization may have positive as well as negative consequences for national, regional and local economies. In times of prosperity, increased openness of the economy can accelerate economic growth. On the other hand, in times of crisis mutual dependence resulting from a more open economy might contribute to its vulnerability and a susceptibility to economic shocks. The latest economic crisis in particular has brought new challenges for national, regional as well as local economies in terms of their ability to recover from economic downturn that may derail them from their growth path. Regions should not only pay attention to developing their competitive advantages, but also to the long-term sustainability of their economic growth and their ability to respond to unexpected shocks. This paper discusses the major factors of regional economic resilience in the context of the increasing integration of the world's economies. Firstly, it provides a brief introduction to the concept of economic resilience and possible ways of measuring it as presented by a variety of experts in economics and regional studies. An analysis of the situation of the Czech regions at NUTS 3 level follows based on GDP and employment data. The sensitivity of regions to economic downturns within the last two economic crises in the Czech Republic is measured in terms of their effect on employment development.

Key Words

region, resilience, economic shock, economic downturn, employment, gross domestic product

JEL Classification: E32, R11, R23

Introduction and methodology

In view of latest economic developments all over the world, the question of the economic resilience of regions in the broadest sense has arisen. Conventionally, the competitiveness of economy at any territorial level was a central indicator for economists regarding a region's ability to generate income and sustain a level of employment in the context of both national and international competition. The economic crisis has brought new challenges for national, regional as well as local economies in terms of their ability to recover from unexpected economic shocks.

Not only should regions pay attention to developing their competitive advantages, but also to the long-term sustainability of their economic growth. In times of economic prosperity, regions mainly concentrate on strengthening their economic capacity in the

areas, which may bring them the fastest economic growth. This may result in a highly specialized economy. Relying on a single branch of an industry and overemphasis on the purely economic aspects of regional economies can, however, have quite serious repercussions. Thus it is worth analysing the capacity of regions to adjust to and/or recover from a severe economic downturn that may derail the regional economy from its growth path.

The main aim of this paper is to discuss the major factors in regional economic resilience in the context of the increasing integration of the world economies. Firstly, the concept of economic resilience will be briefly introduced, followed by an explanation of the main factors affecting regional resilience. Subsequently, this concept is applied to the Czech regions. The methodology used in this paper is principally based on Martin [10], who introduced sensitivity indices of employment development to economic shocks. Changes in the number of employed people are compared with the national average to show whether regional employment has been more sensitive to the economic shocks of the two last economic downturns or has it been more resilient in comparison to the national average. This approach has been selected because it shed light on the basic patterns of economic development in terms of two main macroeconomic indicators that is GDP and employment. It is clear that different set of indicators may be used to assess the resilience. Foster [4] for instance included population change and poverty in her pilot study. Though, employment change represents a common denominator of both researches. This paper was produced with financial support from TA CR under project TD010029 called "Defining subregions for addressing and resolving social and economic disparities."

1. Concept of economic resilience

Existing tendencies towards increased integration and globalization have brought about a variety of changes in the way how each economy develops and/or responds to different stimuli. The power of national economic policies has diminished within the last few decades even though this may not be visible at first sight. New trends might have had positive as well as negative consequences for national, regional and local economies. In times of prosperity, a more open economy can accelerate economic growth. On the other hand, in times of crisis mutual dependence resulting from having more open economies might contribute to their vulnerability and a susceptibility to economic shocks. Especially in response to such difficult times as we have been witnessing since 2008, new approaches appear to offer fresh views on regional and local development, for example, and economy's flexibility and/or resistance to changes of any types from natural disasters, and political turmoil to economic shocks.

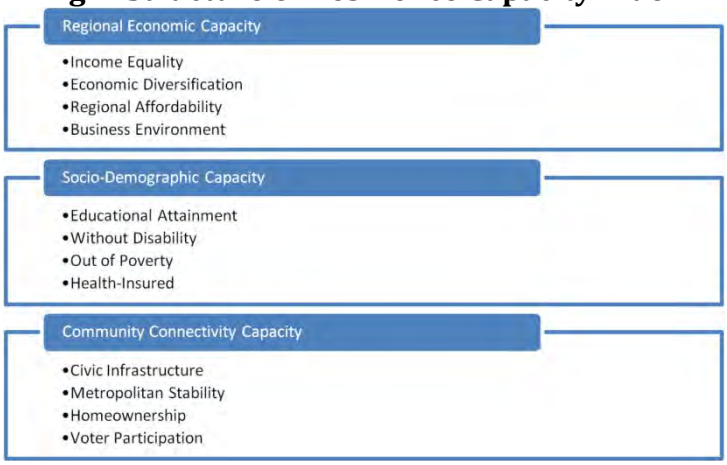
The concept of economic resilience has its origins in environmental studies. Subsequently, experts in regional analysis, spatial development and economic geography have picked up the concept and used it in economics and regional studies. Within the last two years, the number of studies on regional or local resilience has risen rapidly as the world endeavours to overcome the negative consequences of the 2008 financial crisis, which has spread across all sectors and national economies. One of the

most significant contributions to this area of research is the work presented by Rose and Liao (2005), Vale and Campanella (2005), Stehr (2006), Martin (2011), Foster (2007), Hill at al.(2008), Pendall et al. (2010), Christopherson at al. (2010), Ficenec (2010) and at local level, this concept was elaborated by McInroy and Longlands (2010) and Ormerod (2008). In Czech academic literature the concept of regional resilience has been expounded for instance by Kučerová (2006), Lungová (2011), Sucháček (2012).

The concept of economic resilience is not yet broadly accepted among economic experts and it is somewhat in the discussion phase. Yet, in the light of the abating financial crisis, which had severe impacts on many national and regional economies, some of which have not yet been able to recover fully to their growth path, it is worth analysing this concept further [9].

As stated above, there is no general agreement upon the definition of 'economic resilience', nor on the method of how to measure it. Some experts even tend to include into the definition of resilience actions aimed at improving resilience. For instance, Bruneau et. al. characterizes resilience based on four criteria where two of them (redundancy and robustness) represent "the means" of strengthening resilience [1, p. 740]. On the other hand, Rose [11] strictly distinguishes pre-shock actions as a form of mitigation, whereas resilience only covers actions happening during the event. The most common definition of resilience of a regional and/or local economy states that it represents the capability of a local socio-economic system to bounce back from a shock or upheaval of any kind. Foster [4, p. 14] defines regional resilience as a region's ability to estimate, prepare, respond and recover from an economic shock, whereas Hill [5, p. 4] describes resilience as the ability of a region to recover successfully from the shock, which has derailed or has potential to derail the economy from its growth path.

Fig. 1 Structure of Resilience Capacity Index



Source: [4], http://brr.berkeley.edu/rci/, own elaboration

Approaches differ in how best to quantify or measure a region's resilience. Foster has developed the Resilience Capacity Index (RCI) as a single statistic consisting of 12 equally weighted indicators, which reflects the aspects of regional economic, socio-demographic and community attributes. The figure above illustrates the composition of this index. This figure suggests that regional resilience is more than economic resistance

or flexibility. It can help to uncover regional strengths and weaknesses and provides quite a simple comparison of different regional profiles. Obviously, it can be implemented to any regional level where the required data are available.

According to Martin [10] economic resilience encompasses four mutually interlinked aspects: resistance, recovery, re-orientation and renewal. Resistance reflects the sensitivity or depth of reaction of a regional economy to a recessionary shock, which can be quantified in the form of decline in production, the number of jobs, etc. Recovery signify how fast and to which degree an economy gets back to its previous growth path. Re-orientation refers to changes in the industrial structure of an economy as well as the structure of employment and, changes in business models in response to a recessionary shock. Last but not least, renewal represents the resumption of the pre-recession growth path or a shift to new growth trend either faster or slower. Based on these four aspects, crucial factors of regional resilience can be summarized.

Clearly, the structure of the economy will be of key importance. Whereas in times of prosperity, a narowly-specialized economy can grow significantly if its main domain rests in the thriving phase; in times of economic troubles, it may pose a huge threat. Generally speaking, a diverse economic structure is usually assumed to provide better stability and greater resistance to economic shock, though at the expense of a slightly slower economic growth. Moreover, not every instance of diversification is a guarantee of better resistance. Of fundamental importance is the degree of sectoral inter-relatedness that may exist even in a diversified structure. All the same, a highly specialized region may prove to be resistant to an economic shock. Manufacturing and construction industries have usually been regarded as more cyclically sensitive than private service industries and the latter more sensitive than public sector services. Thus, spatial distribution of the above mentioned industries may explain most of the geographical differences in resistance to economic shocks. Nevertheless, the latest economic development implies that even this conclusion has its limits. Having reached a fiscal crisis as an aftermath of the previous financial and economic crisis in many countries, cuts in public sector investment projects have brought about negative repercussions in the regions that should have been considered as relatively stable and/or resistant due to their economic structure.

Another important feature of a resilient regional or local economy may be its flexibility, which is strongly linked to planning and preparation for potential disruptions. Flexibility may relate to human capital, a flexible labour force as well as flexible sourcing of inputs and other factors of production. To support a more flexible labour force it is essential to have effective public services including public transport, education, housing and social care as well as a prosperous community and voluntary sector. Social entrepreneurship could be a good way to support development of local enterprises.

There are various empirical studies investigating the link between resilience and the prevailing industries in the economy. Martin [10] tested the concept of resilience on British regions in connection with four aspects of resilience. Crucial importance was put on the identification of regional differences in resistance, recovery and renewal, whereas the matter of re-orientation was mostly omitted. Based on the dates from the

three main recession during the last four decades, that is 1979 – 1982, 1990 – 1992 and 2008 – 2010, he clearly proved disparities in employment development in particular regions. He used a simple method in which he compared percentage decline in employment and/or output in the region with a reference value equal to the national average level. In this way, he was able to gauge the resistance of the regions by a sort of 'sensitivity indices'. An index greater than one meant that the region in question had higher sensitivity to a recessionary shock (thus lower resilience, whereas an index less than one proved relatively higher resilience (thus lower sensitivity). In comparison, a more advanced econometric technique was used by Fingleton et al. [3], who analysed the impact of the economic recession on the future employment growth in 12 UK regions. Both sets of research uncovered differences in the post-recession employment growth rates, however, they failed to explain why these differences occurred. Martin [10] attributes better adaptive resilience to factors such as the level of new firm formation, the firms' ability to innovate, firms' willingness to change, the diversity of the regional economic structure and the availability of skilled labour, yet, without providing a reasonable statistical background [6]. Chapple and Lester [7] used discriminant analysis to find the essential characteristics of regional resilience. They identified human capital as an important factor for resilience with regard to average earnings per worker. According to them, regions with highly-skilled workes and a high rate of innovation prove to be both more resilient and flexible which was demonstrates on the cases of Austin, Texas and New Jersey. The importance of human capital was also emphasised by Sheffi [13], who relates it to organizational culture as a building block of resilient businesses as well as regions.

2. Example of the Czech Regions

As stated above, economic resilience of regional or local economies can be gauged by means of different approaches and by using different methods. In the following text, a simple method based on Martin's research [10] is used. Attention is paid to employment trends in the Czech regions within the last two downturns, that is, in 1997 – 1999 and 2008 – 2011. Please note that the subsequent analyses have several limits. Firstly, the method itself may be taken only as a rough first step towards future analysis consisting of more profound investigation into the industrial structures of the regional economies. Secondly, the two aforementioned downturns constitute only very small example for comparison, owing to limited time span and the data about the economic development of the Czech economy as single national entity. Thirdly, in the 1990's the Czech economy was going through an economic transition characterised by the re-structuring of industries, which certainly affected economic performance itself.

From the very beginning of this process, regions have developed unevenly, so contributing to the widening of regional economic disparities. Regions with high economic performance succeeded in maintaining dynamic growth, particularly Central Bohemia, Prague and Southern Moravia region. Whereas, the Karlovy Vary region, as a region with a high concentration of basic manufacturing industries, together with the Usti region and Liberec region were noted for the worst economic results. The latter two regions were renowned as centres of the glass and textile industries (Liberec) and the

mining industry (Usti). To illustrate economic development in the Czech regions at NUTS 3 level in the selected years, there follows a table compiling data about GDP development expressed by means of volume indices. The years selected reflect the two main economic downturns after the peaks achieved in 1996 and 2008.

Tab. 1 Regional Gross domestic product, volume indices (1995 = 100), in % – selected years

Region	1996	1997	1998	1999	2008	2009	2010	2011
The Czech Republic	104.5	103.6	103.4	105.1	156.2	149.1	152.8	155.7
Prague	105.7	108.4	112.7	116.7	182.1	172.8	178.3	179.7
Central Bohemia Region	103.9	104.3	108.8	114.9	206.9	193.9	198.4	207.4
South Bohemia Region	104.6	103.8	103.6	104.6	138.5	134.9	136.9	137.9
The Plzen Region	106	102.4	99.5	101.1	144.5	140.5	146	150
The Karlovy Vary Region	98.8	94.5	92.6	92.3	106.5	103.8	101.4	99.4
The Usti Region	102.7	97.7	94.8	94.2	127.4	126.4	124.1	122.4
The Liberec Region	102.4	103.2	100.4	103.7	145.6	136.8	143.2	147.8
The Hradec Kralove Region	104.3	105.9	104.3	106.3	149.4	144.9	149.9	151.1
The Pardubice Region	102.5	102.6	103	102.8	150.1	143.6	149.6	153.4
The Vysocina Region	104.2	101.1	100.5	104.8	156.6	153.1	154.9	158.3
The South Moravian Region	104.4	102.3	102	101.9	151.2	145.4	147.7	151.2
The Olomouc Region	107	102.9	98.7	100.7	141.6	136.8	141.3	144.2
The Zlin Region	102.6	106.4	103.4	102.8	165.3	157	159.7	164
The Moravian-Silesian Region	106.6	102.5	98.3	96.6	131.6	121.6	126.8	131.5

Source: Czech Statistical Office, regional accounts, own elaboration

As Table 1 suggests, the Czech Republic as a whole registered its first economic downturn in terms of a real GDP drop in the years 1997 – 1998. This, however does not relate to all regions. Central Bohemia together with Prague, Zlin and Liberec regions were noted for a slightly postponed decline. Six regions showed the signs of decline in 1998 (Moravian-Silesian region, Zlin, Olomouc, Hradec Kralove, Liberec, and Vysocina regions). Subsequent peak in economic activity was achieved in 2008. The year 2009 is noted for a severe drop in GDP. The cause of the recession in 2009 is attributed principally to external demand shock. The start of this recession was rather fast and internal demand delayed the negative consequences of the external shock. Furthermore, the Czech Republic is one of minority of countries which had not been hit so severely, together with Poland.

Generally speaking, the biggest impact of the economic crisis at regional level was recorded in regions which had showed the most successful economic development in the previous period mostly owing to newly released input capacity after re-structuring its economy, such as Liberec, Plzen and, Moravian-Silesian regions. This might be attributed especially to the huge inflow of foreign investment into those regions from highly developed countries which had tried to resolve their own domestic problems in this way (particularly higher input prices). Despite lower input prices, production could not compete with cheaper products imported from Asia. This became a crucial point for further development in 2008/09.

Even in 2010 some economic experts suggested that we might be experiencing a so called "w-shaped" recession. The latest economic results seem to confirm such a hypothesis. The second recession in 2011 has been different, though. Firstly, its outset

has been rather gradual and unpredictable. Where the first wave of the recession was mostly the result of external development, in the currently situation, it is only exports that mitigate the slowdown of the economy. In a way, the situation is reminiscent of the recession in 1997/98, but the question remains whether the same sectors and/or the same regions will be most heavily affected [12, p. 6]. Based on GDP data, the less afflicted regions were Central Bohemia, Prague, Pardubice and Zlin regions, which have succeeded in directing their industrial structure towards global demand as well as those with a higher proportion of service sector industries (especially Prague). [8]

Now, let's focus on data about employment as a structural and short-term indicator. Not only does it cast some light on the structure of labour markets and economic systems, but it also reveals economic cycles. On the other hand, employment is deemed to be the so-called 'lagging indicator', which means that changes in general economic conditions lead to changes in employment. In other words, there is a sort of postponed repercussion in the number of employed person when an economy suffers from an economic downturn. In addition, employment as an indicator is affected by many mutually inter-related aspects. Yet, it is worth analyzing employment rather than unemployment rate, due to the current changes in the calculation of the rate of unemployment by the Czech statistical office. The new formula presented in December 2012, expresses the ratio of unemployed people to the number in the whole population in the age range 15 – 64, whereas the former formula used to the compare number of unemployed people to the economically active population. In reality, it means that the denominator of the formula has been increased by the number of people who do not want to and/or are unable to work, such as young people at school, parents on maternity leave, pensioners, and the long term sick and handicapped. The main result of such an adjustment is clear; an immediate drop in the unemployment rate by about two percentage points without any real change in the number of unemployed people. Furthermore, its information value has changed considerably.

Finally, let us see how sensitively employment responded in the given regions to economic shocks in comparison to the national average. An overview of the percentage change in the number of employed people between the highest and lowest points in time in the two analysed economic downturns is provided, together with indices of the sensitivity which is measured as the rate of employment decline in the region against the national average decline in the same period. Greater than one, the index means a higher sensitivity to economic shock, whereas less than one, suggests an economy with a higher resilience to economic downturn.

The latest economic crisis has primarily affected employment in the secondary sector (manufacturing and construction industries) where there has been a notable drop in the number of employed by more than 120 thousand in 2009. The biggest proportion of employment in the secondary sector is in the Liberec, Zlin and Pardubice regions, however, one quarter of people working in industry and construction come from Moravian-Silesian region and the Central Bohemia region. Yet, the latter two regions are noted for an even more fundamental proportion of employment in the service sector. That may explain the data in the table below.

Tab. 2 "Sensitivity" indices of relative employment contraction in previous two downturns

Region	**% change 97/99**	Sensitivity index	**% change 08/10**	Sensitivity index	**% change 08/11**	Sensitivity index
The Czech Republic	-4.9		-2.34		-2.6	
Prague	-2.36	0.48	0.49	0.21	-3.76	1.44
Central Bohemia Region	-1.84	0.37	0.12	-0.05	1.49	-0.57
South Bohemia Region	-2.9	0.59	-4.9	2.09	-4.7	1.81
The Plzen Region	-4.84	0.99	-2.29	0.98	-1.49	0.57
The Karlovy Vary Region	-5.4	1.1	-2.48	1.06	-4.33	1.66
The Usti Region	-4.48	0.91	-2.81	1.2	-2.44	0.94
The Liberec Region	-3.55	0.72	0.88	-0.37	-0.88	0.34
The Hradec Kralove Region	-4.13	0.84	-4.44	1.9	-4.85	1.87
The Pardubice Region	-5.75	1.17	-4.28	1.83	-2.77	1.07
The Vysocina Region	-1.56	0.32	-4.04	1.73	-5.86	2.25
The South Moravian Region	-5.22	1.06	-0.98	0.42	-0.62	0.24
The Olomouc Region	-6.64	1.35	-6.29	2.69	-4.6	1.77
The Zlin Region	-6.05	1.23	-7.35	3.13	-5.42	2.09
The Moravian-Silesian Region	-11.73	2.39	-4.62	1.97	-4.91	1.89

Source: Czech Statistical Office, regional accounts, own elaboration

Where all Moravian regions, (except South Moravian) together with South Bohemia and Hradec Kralove regions registered a more severe drop in employment in comparison to the national average in the latest crisis, the Central Bohemia region and Liberec region managed to show a little increase. The Liberec region in particular may emerge as a surprise due to the fact that Liberec in one of only three regions (together with Zlin and Vysocina) with lower than 50% share of employment in the service sector.

Of course, the data provided in the text instigate a wide range of questions. However, the noticeably ambiguous results regarding the responsiveness of some regions to economic shocks in both the given economic downturns combined with their economic structure, call for a more comprehensive and detailed analyses which should be carried out as part of the follow-up research.

Conclusion

As Martin [10] claims, adaptive economic resilience is affected by many factors starting with the level of new firm formation, the firms' ability to innovate, their willingness to change, the diversity of the regional economic structure and ending with the availability of skilled labour. Being able to analyse the regional capacity to adapt to economic changes and bounce back to its growth path after having been derailed by an economic shock, it is of crucial importance to have the data to investigate it. Currently, econometric evidence is still missing on why regional resilience differs within the same industry and which types of industry structures and employment characteristics might be a source of regional industrial resilience. No doubt this analysis may contribute to identifying major factors underlying the stability of economic development of any region and/or place. Unless we uncover these factors, it will be difficult to come up with reasonable actions supporting the economic resilience of regions.

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SMEs Requirements on „Non-ICT“ Skills by ICT Managers – The Innovative Potential

Abstract

ICT, SME and Innovations – these three words and their combination conceal within them the great expectations of the current stagnating economy, which is balancing on the brink of the abyss of a global crisis. Small and Medium Enterprises (SMEs) are expected to be drivers of actual economic situation. In present-day Europe the proportion of SMEs in the total number of enterprises represents around 80 % and roughly 75 % of jobs and SME business units represent approximately 98 % of business units in the whole Czech Republic. SMEs also provide approximately 80 % of all jobs on labor market in our country. The aim of this paper is to present the analysis of SME requirements on „non-ICT“ knowledge and skills of ICT managers in the Czech Republic. Here presented analysis takes into account differences between small and medium companies in requirements on ICT managers. The results part contains detailed analysis about companies´ requirements on „non-ICT““ knowledge. The article is divided into two main parts. The first part briefly describes actual situation in innovations processes in SMEs (macroeconomic data analysis from Czech Statistical Office) in the Czech Republic and it describes methodology and the most important information about survey that provides information presented in this paper. The methodology frame uses the SMEs specification as is applied in EU. There are used statistical methods for evaluation of „non-ICT“ knowledge. The second part contains results from the analysis about companies´ requirements on ICT managers „non-ICT“ knowledge with accent on differences between small and medium enterprises. Conclusions are devoted to comparison of category of SMEs to category of large corporation in the Czech economy. Requirements of companies on ICT managers do not depend on the size of the company very much. We identified larger requirements on ICT knowledge by small enterprises; on the other hand medium enterprises have higher requirements on „non-ICT“ knowledge and skills.

Key Words

small and medium enterprises (SMEs), competitiveness, „non-ICT“ knowledge, human factor in ICT

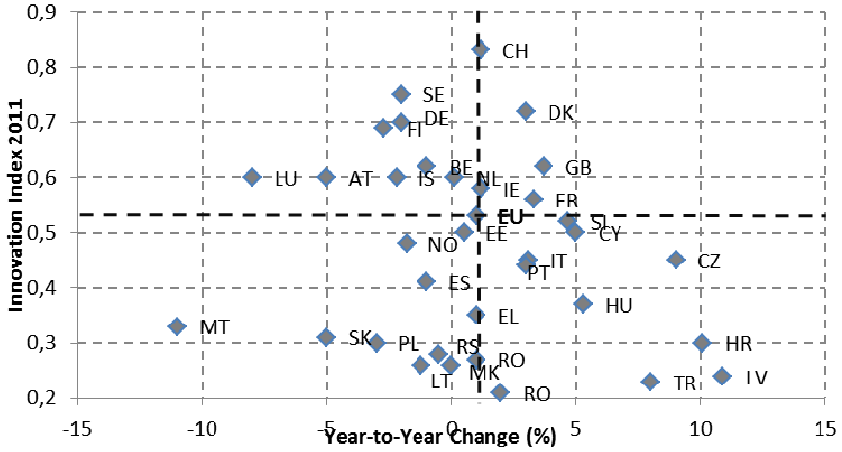
JEL Classification: M15, O15, O32, Q55

Introduction

The problems of small and medium enterprises (SMEs) in the innovation sphere represent the main focus of interest of research at present because this category of firms represents dynamic potential for the development of our society and economy. International comparison of the Czech Republic shows that, in spite of the relatively favorable economic situation and the ability to utilize the benefits from **produced**

innovations [3], the overall innovation performance of the Czech Republic does not achieve, according to the data given in Fig. 1, even the average of the EU27. The chief shortcomings of the innovation environment in the country continue to be the insufficiency of invested risk capital, which supports rapidly growing innovating enterprises and the general attitude of firms to cooperation in innovation activities, whereas so far they prefer the innovation development they pay for themselves.[17] The fact that companies under foreign control achieve far greater income from innovated products (almost five times greater) may to a certain extent be due to the reserved attitude of Czech firms to the innovation process. For the higher innovation performance of the Czech Republic it is also necessary that firms understand the innovation process as an **essential part of successful business**. 30.9 % of enterprises perceive the shortage of financial means in firms as a very important barrier to carrying out innovation activities.

Fig. 1 Innovation Performance According to the Overall Innovation Index from 2011



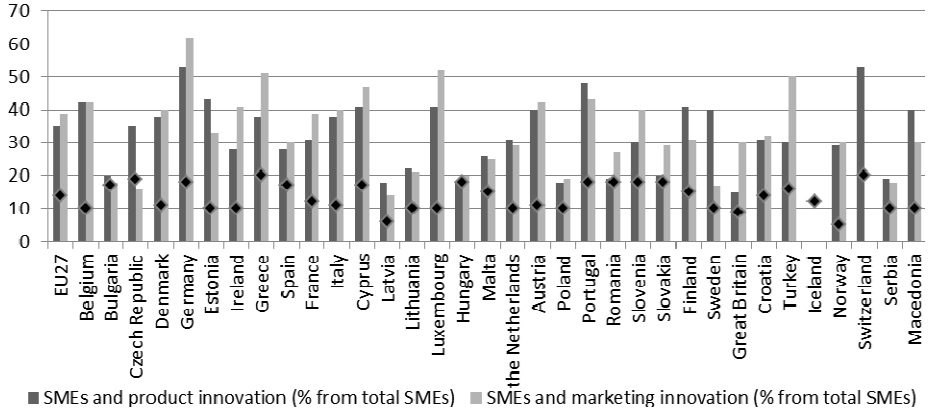
Note: The EU27 average is marked with a cross, which separates the individual quadrants with a higher/lower value of innovation index/inter-annual change

Source: [12]

There are also further barriers that influence the convergence of the Czech Republic with the countries with the most advanced economies. These are, for instance, the slow growth of labor productivity and the economy in general. [5] The most important sector, which constantly strengthens the ability of the Czech economy to compete, continues to be the processing industry. The costs of technical innovation activities and enterprise research in the processing industry are by far the highest and the income from new products on the market or for the firm forms a considerable part of the takings of enterprises in the processing industry (36.5 %). The main share of the income, however, continues to come from non-innovated products. The branches of the processing industry with high demands on know-how are also by far the most active in their own research and in innovation activities and they are capable of realizing their products and services on foreign markets. The growth of the share of high-tech export in total export may not be conspicuous; nevertheless the continuing growth of the high-tech turnover and the growing active balance of high-tech trade testify to the fact that the economic crisis was not as pronounced in the foreign trade in high-tech. [17] Innovation activities

of small and medium enterprises and their overall comparison with the other states of Europe are shown in the following Fig. 2.

Fig. 2 Innovation Activities of .SMEs – Comparison of European Countries



Source: [12]

2.1 Innovation Performance of the Czech Republic in the Context of Europe

The foundation stone of the competitive ability of the firms and even the entire economies of the countries of the present world is based in particular on the ability to create, introduce and utilize practically permanent innovations. Technological change was and is long considered to be one of the strongest engines of competitiveness.[14] The ability to implement new findings commercially [15]; to quickly adapt new technologies and processes in one's own field of activity, is decisive for the growth of the economy in the strong competition of the globalized market. [4] With its innovation performance the Czech Republic is still below the average for the EU and thus ranks in the category of average innovators along with Poland, Hungary, Slovakia and also, for instance, Italy (Fig. 1). The leading economies in the innovation sphere in the EU are Finland, Germany, Denmark and Sweden. Their overall innovation index is minimally 20 % higher than the average for the EU27. Although the Czech Republic, together with several other states of Central and Eastern Europe, is in the position of a country with low innovation performance, its position has improved in the last few years. [12]

3. Problem Formulation

If we consider SMEs to be the motor for innovations in the present economy, then an intrinsic part of today's innovations is the implementation of the means of information and communication technology (ICT). Of course the actual implementation of ICT is simultaneously also linked with the capacity to utilize it, especially on the part of ICT managers.[1] This is why the key factor of innovations through ICT is knowledge of them and not only knowledge of ICT itself, but also knowledge that at first sight has not much in common with the implementation of ICT – so-called „non-ICT" knowledge ([2], [5], [9], [6], [7]). **The aim of this paper is to analyze the requirements of SMEs for „non-**

ICT“ knowledge, which ICT managers should have at their disposal in order to become the bearers of innovations for SMEs and thus become attractive to the labor market in this important segment of the Czech economy.

The aim of this paper is not to analyze specific knowledge that is required for example for special systems described in [16].

4. Methodology

The European Union divides companies into 5 categories that are defined by the number of employees, by the amount of turnover and by the total balanced sheet. Based on the number of employee, the EU recognize individual companies (0 – 1 employee), micro companies (2 – 9 employees), small companies (10 – 49), medium companies (50 – 249) and large companies that have more than 249 employees. ([10], [11])

Size of entity: According to the number of employees, 3 categories were used in our research: 0 – 49 (individual, micro and small companies), 50 – 249, 250 and more.

The EU defines small and medium companies ([10], [11]) by staff headcount and financial ceilings. The category of micro, small and medium-sized companies (SMEs) are all companies which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. A small companies are companies which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million and a micro companies (we have linked this category to small companies) is defined as an companies which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million. ([10], [11])

4.1 Survey Among Businesses

According to data of the Czech Statistical Office, there were 1,266,336 subjects of various size and main economic activity. Sector of main economic activity: There are 17 main sectors in Industrial Classification of Economic Activities of the Czech Statistical Office. According to the requirements on information technologies, these sectors were coded into 3 categories: sectors with the lowest requirements (MIT), sectors with the middle requirements (SIT) and sectors with the highest requirements (VIT). We have coded companies also according to the number of employees into three categories (less than 49 employees, 50 – 249 employees and more than 249 employees). The structure of companies selected for the survey is described by the Table 1.

The survey was realized by the private research company among clusters of companies that respect structure of companies in the economy of the Czech Republic. The interviewing methods used were CAWI (Computer Aided Web Interviewing) and CATI (Computer-assisted Personal Interviewing).

Tab 1 Structure of the Observed Sample 2010

	0 – 49	50 – 249	250 +	Total
MIT	45	46	44	135
SIT	57	474	98	629
VIT	66	142	39	247
Total	168	662	181	1,011

Source: authors

4.2 Skills Categories and Knowledge Levels

We have been concentrating on the 16 skill categories in our survey. We have defined (based on similar studies in Europe and world) following 16 skills categories in our survey: **ICT knowledge** – MS01 – Process modeling, MS02 – Functionality and customization, MS03 – Management IS/ICT, MS04 – Analysis and design, MS05 – Software engineering, MS06 – Data and information engineering, MS07 – IS/ICT knowledge, MS08 – Operational excellence and **„non-ICT" knowledge** – *MS09 – Team leadership skills, MS10 – ICT market knowledge, MS11 – Organizational management methods, MS12 – Enterprise finance and economics, MS13 – Sales and marketing, MS14 – Quantitative methods, MS15 – Law, MS16 – Knowledge in specific business sectors*. These skills categories are described in detail for example in [13].

We have defined 6 knowledge levels (Level 0 – No knowledge – Level 5 – Highest knowledge quality and advanced practical skills). Each of 16 skills categories were assessed by companies´ representatives and their requirements on knowledge level in all defined knowledge domains with respect to defined knowledge levels.

Received results were analyzed and assessed by authors by way of standard statistical methods like average, median, skew, skewness and others. Results presented in further text present average values calculated for each knowledge domain for each group of investigation.

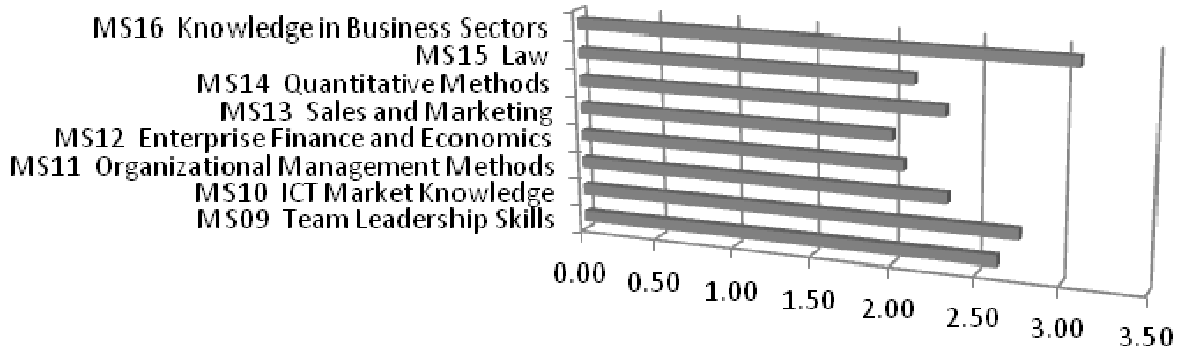
5. Results

5.1 Small Enterprises up to 49 Employees

Small Enterprises is the special group in the Czech economy. They represent main driver of it, because they offer 80 % of jobs and represent a little less than 98 % of active business units of domestic economy.[8] On the other hand the majority of them are one person show – they do not have employees and only one person (the owner) is active in this subject. Small companies are usually described in the Czech Republic as dynamic companies which can be established during few days and are represented especially by self-employment. They are usually as subcontractors for further bigger companies. On contrary for small companies is more difficult to receive loans from banks and they have also problems to get larger contracts especially from state and public administration sector. Requirements on „non-ICT" – knowledge of ICT managers are presented on Fig.

3.Results present the largest knowledge requirements in core business sector – domain "MS16 – Knowledge in specific business sectors" (average value 3.08) for small and medium enterprises. Further requirements were identified in following knowledge domains – "MS10 – ICT market knowledge" (average value 2.76) and "MS09 – Team leadership skills" (average value 2.63). On the other side of the scale has been identified the knowledge domain "MS13 Sales and Marketing".

Fig. 3 Requirements on non-ICT Knowledge in Small Enterprises

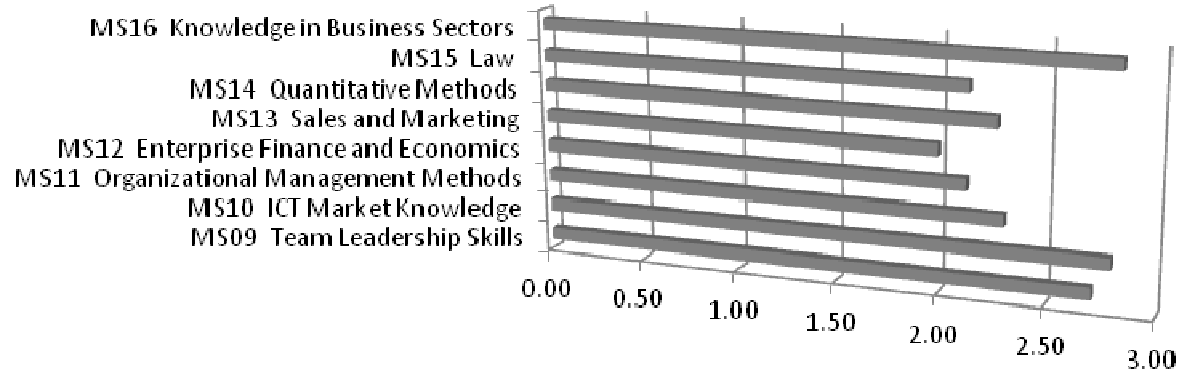


Source: authors

5.2 Medium Enterprises 50-249 Employees

This group represents a little less than 1 % of active business units on the Czech market. [8] These companies have a lot of similar characteristic as small companies. Those are adaptable to changes in the economic environment. These companies use small and micro companies sometimes as subcontractors if they have bigger projects or contracts etc. On contrary medium companies usually exist for a longer period so they are established, they have credit history, relative stable organizational structure and so they have easier access to capital and loans. Medium companies have also some negatives aspects. As a typical feature of them is segregated management and the relations among users and employees can be worse than in small ones. Requirements on „non-ICT" knowledge of ICT managers in medium enterprises are presented on Fig. 4.

Fig. 4 Requirements on „non-ICT" Knowledge in Medium Enterprises



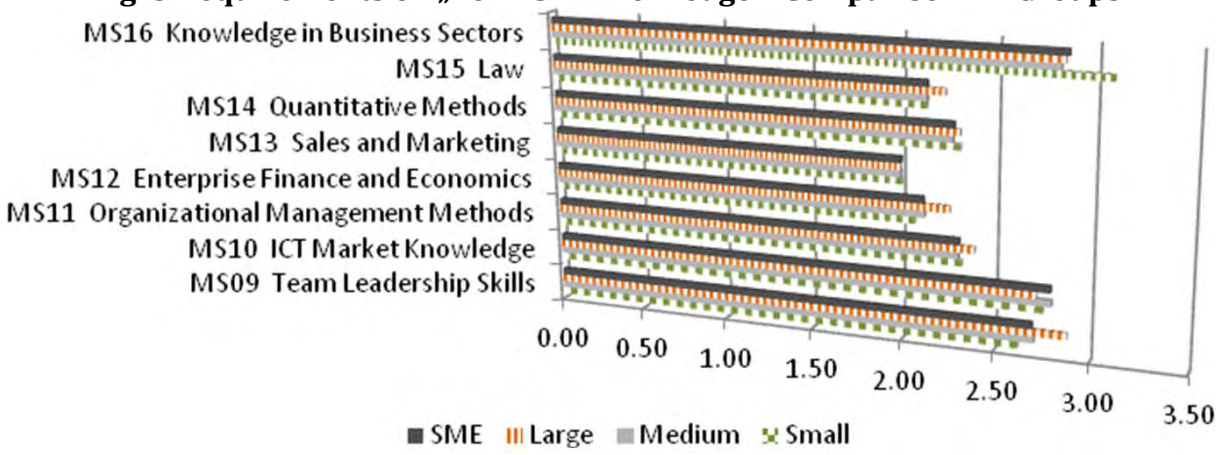
Source: authors

Medium sized enterprises focus main accent on knowledge in core business sector as well – domain "MS16 – Knowledge in specific business sectors" (value 2.82). Further requirements were identified in following knowledge domains – "MS10 – ICT market knowledge" (average value 2.80) and "MS09 – Team leadership skills" (average value 2.71). On the other side of the scale has been identified the knowledge domain "MS13 Sales and Marketing" (average value 1.99).

5.3 Analysis of Differences in Requirements between SMEs and Large Firms

This chapter is devoted to description of changes in requirements on analyzed roles in small and medium enterprises. We are comparing average and median values for small and medium enterprises in comparison to large ones. The Fig. 4 presents average and median values on „non-ICT" knowledge required by companies in all groups (small, medium and large). There is visible (Fig. 3 and Fig. 4) that the most required level of „non-ICT" knowledge reach values between 2.50 and 3.00 knowledge domains (MS09, MS10, MS16).

Fig. 5 Requirements on „non-ICT" Knowledge – Comparison All Groups



Source: authors

Medium and Small enterprises require ICT manager knowledge in very similar. Fig. 5 shows differences in these requirements. The smallest differences were indicated in knowledge domains MS11 – Organizational management methods, MS13 – Sales and marketing and MS15 – Law (difference is less than 0.02). Little bigger difference was identified for domains MS09 – Team leadership skills (0.08), MS10 – ICT market knowledge (0.04), MS12 – Enterprise finance and economics (0.05) and MS15 – Law (0.04). The biggest difference in knowledge requirements is visible in domain MS16 – Knowledge in specific business sectors. There was identified the difference value 0.26 with bigger requirements of Small enterprises in this knowledge domain. This finding could evoke the conclusion that small enterprises do need not only the ICT manager, but also this person must be equipped with competences in enterprise's core business. For comparison between SMEs and Large Enterprises in „non-ICT" knowledge is typical that that Large enterprises have higher requirements namely on MS09 – Team leadership

skills (0.18), MS12 – Enterprise finance and economics (0.14), MS15 – Law (0.10) and MS11 – Organizational management methods (0.08). For other domains are differences in requirements not so big (MS13, MS14, MS16). One exception is the domain MS10 – ICT market knowledge, where are requirements of large enterprises lower then of SMEs.

Conclusions

The competitive ability of economies is accelerated in particular by innovations. These are then significantly influenced by the implementation of ICT in the running of SMEs in particular. The extent of the use of ICT and its immediate influence on innovation activities depends on the one hand on the ability of ICT workers to utilize these innovation activities [7] and on the other hand on the ability of ICT managers to integrate these technologies in the operation and development of companies. The quality of the managers in general, and not just ICT managers, depends on their knowledge and skills. Their knowledge should not be confined to specialization in a certain field – in the case of ICT managers the field of ICT – but should also include knowledge outside the field of ICT, known as „non-ICT" knowledge. The conclusions reached from the comparison of requirements for „non-ICT" knowledge among small, medium and large companies are useful from the macro-economic viewpoint not only for the companies themselves and for potential applicants for the position of ICT managers in this segment of the economy, but also for the Higher Education Institutions (HEIs), which train managers. The most important „non-ICT" knowledge, which ICT managers should have at their disposal according to the conclusions of our investigation, is as follows – knowledge of the appropriate sector of the economy in which companies are active – required mainly by small firms, and knowledge of leadership and work teams – preferred by companies with a larger number of employees. All enterprises have generally comparable requirements for the other fields of knowledge studied in the investigation.

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Use of DEA Approach to Measuring Efficiency Trend in Old EU Member States

Abstract

The paper deals with measuring and evaluation of efficiency trend in the "old" European Union (EU) countries (EU15) by Data Envelopment Analysis (DEA) approach. The aim of the paper is to measure and assess efficiency potential of old EU countries (EU15) in reference years 2000-2011 by advanced DEA approach – the Malmquist index. The main purpose of used DEA approach is to measure efficiency changes over the reference period and to analyse a level of productivity in individual EU countries based on the Malmquist index, and then to classify the old EU Member States to homogeneous units (clusters) according to efficiency results based on the Cluster analysis. Using of DEA approach for efficiency evaluation is convenient because DEA method is based on ratio between input- and output-indicators and measures thus efficiency with old EU countries are able to transform their inputs into outputs. Efficiency can be thus considered as a 'source' of competitiveness. The first part is focused on theoretical background of efficiency in the context of effectiveness and advanced DEA method. Application part is concentrated on evaluation of EU15 countries efficiency in the frame of the Malmquist index for efficiency measuring and the Cluster analysis for jurisdiction of evaluated countries. Each country is ranked in terms of their competitive/uncompetitive position within the group of EU15 countries. Based on efficiency results, the comparison of competitiveness based on the efficiency level of countries is included.

Key Words

cluster analysis, DEA approach, efficiency/inefficiency, Malmquist index, old EU member states

JEL Classification: C67, C82, O11, O33, Y10

Introduction

European Union (EU) is a heterogeneous unit with significant disparities between its Member States and especially between their regions and with unbalanced territorial allocation of economic and social activities resulting in different living standard. These facts have a negative impact on balanced development across EU. The support of cohesion and balanced regional development together with increasing level of EU competitiveness belong to the *EU key development objectives*. Strengthening of cohesion in order to support balanced development of EU countries and regions is being carried out by the *EU Cohesion Policy* purposing to reduce disparities in European territories and strengthening of competitiveness. The EU Cohesion Policy has an important role in enhancing of competitiveness and prosperity. From the long-term perspectives, competitiveness requires paying attention not only to economic but also to social and

environmental factors, in recent years especially to territorial characteristics of areas – *cohesion* and *competitiveness* are thus *partly complementary goals* [7]. In relation to competitiveness objective, *performance* and *efficiency* are *complementary objectives*, which determine the long-term development of countries and regions. *Measurement, analysis and evaluation of productivity changes, efficiency and level of competitiveness are controversial topics* acquire great interest among researchers, because performance remains one of the basic standards of efficiency evaluation and it is also seen as a reflection of success of area (country/region) in a wider (international/inter-regional) comparison; see e.g. [4], [8].

1. Theoretical framework of efficiency concept

Competitiveness in the level of performance is a major obstacle to the balanced and harmonious development of the regions, but also of the territory. Analysis of competitiveness brings the important information about the key problematic issues in region (and thus in country) on the one side and its development and competitive potential on the other side.

1.1 Relationship between concepts of efficiency and effectiveness

The current economic situation determined by the effects of the crisis is causing the governments of the countries worldwide to streamline their processes in terms of collecting revenue from the state budget and then redistributing it on the principle of performance and economic efficiency. In this sense the comparative analysis of the efficiency in the public sector is the starting point for studying the role of efficiency, effectiveness and performance regarding the economic governance of resources utilization by the public management for achieving medium and long-term objectives of economic recovery and sustainable development of national economies [5]. As the world struggles to accommodate the enormous growth in population and to manage the distribution of resources, to reach higher competitive potential, the effort to make things more efficient has become increasingly more relevant. The economy may be competitive but if the society and the environment suffer too much the country will face major difficulties. The same problem would happen vice versa when the economy is too weak. Therefore governments in the long run period cannot focus alone on the economic competitiveness of their country; instead they need an integrated approach to govern the country and focus on the broadest aspects affecting efficiency.

Efficiency is a central issue in analyses of economic growth, the effects of fiscal policies, the pricing of capital assets, the level of investments, the technology changes and production technology, and other economic topics and indicators. In general sense, the *efficiency can be achieved under the conditions of maximizing the results of an action in relation to the resources used, and it is calculated by comparing the effects obtained in their efforts*. In a competitive economy, therefore, the issue of efficiency, resp. dynamic efficiency, can be resolved by comparing these economic issues. The efficiency is an indicator that is obtained by reporting the outcome effects to the efforts made. *The*

efficiency of public expenses implies a relation between the economic and social effects resulted from implementing a program and the effort made to finance that program. According to reference [6], there is no efficiency without effectiveness, because it is more important to do well what you have proposed than do well something else that was not necessarily concerned. *Relationship between efficiency* and *effectiveness* is that of a part to the whole, the effectiveness is a necessary condition to achieving efficiency. Efficiency and effectiveness analysis is based on relationship between *inputs (entries), outputs (results)* and *outcomes (effects)*.

1.2 Evaluation to efficiency

There are difficulties in *measuring efficiency* and *effectiveness*. Progress has been made in developing the necessary measurement techniques, but there is a lack of suitable data to apply those techniques. Good quality data are needed because the techniques available to measure efficiency are sensitive to outliers and may be influenced by exogenous factors. Measurement of efficiency and effectiveness is highly sensitive to the data sets being used. *The data used for international comparisons* require a minimum level of homogeneity. Nevertheless, it is unavoidable that such data reflect the different organisations and traditions of government and therefore are not fully comparable between countries. Another complication which one encountered, when measuring efficiency and effectiveness, is in terms of the identification of inputs and outputs. As regards quality of inputs and outputs, the quality adjustment is one of the most pressing challenges in measuring efficiency. Many studies assume that the quality of inputs and outputs is equivalent across countries. However, this does not match with reality. Therefore, quality adjustments should be made. However, quality adjustment is still in its infancy and there are no ready-made solutions. If the quality of inputs and outputs is not properly taken into account when measuring efficiency, an underestimation of efficiency may result [6].

The analysis of efficiency and effectiveness is about the relationships between inputs, outputs and outcomes. In 1957, Farrell already investigated the question how to measure efficiency and highlighted its relevance for economic policy makers. "*It is important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources*." [3]. Farrell confined his numerical examples and discussion to single output situations, although he was able to formulate a multiple output case. Twenty years after *Farrell's model*, and building on those ideas. Since that time techniques to measure efficiency have improved and investigations of efficiency have become more frequent, particularly in industry. Charnes et al. (1978), responding to the need for satisfactory procedures to assess the relative efficiencies of multi-input/multi-output production units, introduced a powerful methodology which has been titled *Data Envelopment Analysis* (DEA) [2]. Nevertheless, the measurement of efficiency and effectiveness of countries and regions, resp. their factors, *remains a conceptual challenge*.

2. Measuring of efficiency trend in old EU member states by DEA approach

2.1 Multivariate methods and efficiency analysis

Between collections of multivariate statistical methods, it can be included e.g. Method of main components, Factor analysis, or Cluster analysis and DEA method, which are used in the paper. Measuring the efficiency level of evaluated countries is based on procedure in Tab. 1.

Tab. 1 Basic scheme of efficiency measuring and evaluation

Pre-processing phase – Input data analysis
Collection of indicators » Data analysis of indicators » Groups of indicators for input and output
DEA modelling
Malmquist index » Efficiency evaluation
Cluster analysis
Hierarchical cluster analysis » Ward's method » Cluster description

Source: Own elaboration, 2013

The efficiency analysis, based on application of *Cluster Analysis* (FA) and specialized DEA approach – *Malmquist Index*, is used for evaluating national development quality and potential (with respect to the national factors endowment). DEA method becomes a suitable tool for ranking competitive (uncompetitive) position of countries based on efficiency within the group of evaluated countries. Based on the above facts, it is possible to determine the *initial hypothesis* of the analysis. The hypothesis is based on the assumption that EU Member States achieving best results in efficiency (more advanced *Scandinavian countries*) are countries best at converting inputs into outputs and therefore having greater performance and productive potential than other countries within the group of evaluated countries, especially *Mediterranean countries* with regard to the economic crisis.

The efficiency analysis starts from building database of indicators that are part of a common approach of WEF and EU in the form of *Country Competitiveness Index* (CCI). The aim of this approach is to develop a rigorous method to benchmark national competitiveness and to identify the key factors which drive the low competitiveness performance of some countries. The reference to CCI is the well-established *Global Competitiveness Index* (GCI) by WEF. Eleven pillars of CCI are grouped according to the different dimensions (input versus output aspects) of national competitiveness they describe. Set of CCI data file, resp. pillars consist of 66 CCI indicators – 38 of them are inputs and 28 outputs. Indicators are thus also classified in two groups – *inputs and outputs according to its nature*, resp. into those which describe driving forces of competitiveness, and those which are direct or indirect outcomes of a competitive society and economy. From this point of view, DEA method is convenient approach for evaluation of national efficiency (with respect to the national factor endowment). The indicators selected for the CCI framework are all of quantitative type (hard data) and the preferred source has been *the European Statistical Office*. Whenever information has been unavailable or inappropriate at the required territorial level, other data sources

have been explored such as the *World Bank*, *Euro barometer*, *Organization for Economic Co-operation and Development* and *European Cluster Observatory*. In this paper, all CCI indicators are not used because all indicators were not available for the whole period for each country, but for some indicators were found comparable indicators. The pillars and 62 used CCI indicators are listed in Tab. 2.

Tab. 2 Indicators of inputs and outputs in years 2000 – 2007 – 2008 – 2011 relevant to DEA

Dimension	Pillar	Indicator of input and output*
Inputs	*Institution*	Political Stability, Voice and Accountability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption
	Macroeconomic Stability	Harmonized Index of Consumer Prices, Gross Fixed Capital Formation; Income, Saving and Net Lending/Net Borrowing, Total Intramural Research & Development Expenditure, Labour Productivity per Person Employed; ~~General Government Gross Debt~~
	Infrastructure	Railway transport – Length of Tracks, Air Transport of Passengers, Volume of Passenger Transport, Volume of Freight Transport; Motorway Transport –Length of Motorways, Air Transport of Freight
	Health	Healthy Life Expectancy, Infant Mortality Rate, Cancer Disease Death Rate, Heart Disease Death Rate, Suicide Death Rate; Hospital Beds, Road Fatalities
	Primary, Secondary and Tertiary Education; Training and Lifelong Learning	Mathematics-Science-Technology Enrolments and Graduates, Pupils to Teachers Ratio, Financial Aid to Students, Total Public Expenditure at Primary Level of Education, Total Public Expenditure at Secondary Level of Education, Total Public Expenditure at Tertiary Level of Education, Participants in Early Education, Participation in Higher Education, Early Leavers from Education and Training, Accessibility to Universities; Lifelong Learning
	Indicators for Technological Readiness	Level of Internet Access; E-government Availability
Outputs	*Labour Market Efficiency*	Labour productivity, Male employment, Female employment, Male unemployment, Female unemployment, Public expenditure on Labour Market Policies; Employment rate, Long-term unemployment, Unemployment rate
	Market Size	Gross Domestic Product; Compensation of employees, Disposable income
	Business Sophistication	Gross Value Added in sophisticated sectors, Employment in sophisticated sectors, ~~Venture capital (investments early stage), Venture capital (expansion-replacement)~~
	Innovation	Human resources in Science and Technology, Total patent applications, Employment in technology and knowledge-intensive sectors, Employment in technology and knowledge-intensive sectors-by gender, Employment in technology and knowledge-intensive sectors-by type of occupation, Human resources in Science and Technology – Core, Patent applications to the EPO, Total intramural R&D expenditure, High-tech patent applications to the EPO, ICT patent applications to the EPO, Biotechnology patent applications to the EPO; ~~Employment in technology and knowledge-intensive sectors-by level of education~~

Note: * Number of inputs was decreased from 38 to 37; Number of outputs was decreased from 28 to 25

Source: [1]; own elaboration, 2013

Empirical analysis is based on specialized DEA approach – Malmquist productivity index (MI) for measuring the change of technical efficiency and the movement of the frontier in terms of each country, in reference years 2000 – 2011, resp. year 2000 presents beginning of growth period *and year 2011* represents last year of complete data-base for each evaluated country and post-crisis year. In this paper the *analysis of efficiency* is solved as primary initial analysis. MI is used for complete data-base of 62 used indicators divided in groups of inputs and outputs exactly according to CCI concept. Suppose we have a production function in time period *t* as well as period *t+1*. MI calculation requires two single period and two mixed period measures. The two single period measures can be obtained by using the *CCR model with Constant Returns to Scale* (CRS). For simplicity of MI calculation, it is presented basic DEA model based on assumption of a single input and output.

Suppose each DMU_j *(j=1, 2... n)* produces a vector of output $y_j^t = \left(y_{1j}^t, \ldots, y_{sj}^t\right)$ by using a vector of inputs $x_j^t = \left(x_{1j}^t, \ldots, x_{mj}^t\right)$ at each time period *t, t=1... T*. From time *t* to time *t+1*, DMU_0's efficiency may change or (and) the frontier may shift. MI is calculated via (1) comparing x_0^t to the frontier at time *t*, i.e., calculating $\theta_0^t\left(x_0^t, y_0^t\right)$ in the following input-oriented CCR CRS model (1):

$$\theta_0^t\left(x_0^t, y_0^t\right) = \min \theta_0 \tag{1}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^t \le \theta_0 x_0^t,\ \sum_{j=1}^{n} \lambda_j y_j^t \ge y_0^t,\ \lambda_j \ge 0,\ j = 1, \ldots, n,$$

where $x_0^t = \left(x_{10}^t, \ldots, x_{m0}^t\right)$ and $y_0^t = \left(y_{10}^t, \ldots, y_{s0}^t\right)$ are input and output vectors of DMU_0 among others. MI is further calculated via (2) comparing x_0^{t+1} to the frontier at time *t+1*, i.e., calculating $\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)$ in the following input-oriented CCR CRS model (2) for $\lambda_j \ge 0,\ j = 1, \ldots, n$:

$$\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right) = \min \theta_0 \tag{2}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^{t+1} \le \theta_0 x_0^{t+1},\ \sum_{j=1}^{n} \lambda_j y_j^{t+1} \ge y_0^{t+1}.$$

MI is further calculated via (3) comparing x_0^t to the frontier at time *t+1*, i.e., calculating $\theta_0^{t+1}\left(x_0^t, y_0^t\right)$ via the following linear program (3) for $\lambda_j \ge 0,\ j = 1, \ldots, n$:

$$\theta_0^{t+1}\left(x_0^t, y_0^t\right) = \min \theta_0 \tag{3}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^{t+1} \le \theta_0 x_0^t,\ \sum_{j=1}^{n} \lambda_j x_j^{t+1} \ge y_0^{t+1}.$$

MI is further calculated via (4) comparing x_0^{t+1} to the frontier at time *t,* i.e., calculating $\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right)$ via the following linear program (4) for $\lambda_j \geq 0,\ j = 1, \ldots, n$:

$$\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right) = \min \theta_0 \tag{4}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^t \leq \theta_0 x_0^{t+1},\ \sum_{j=1}^{n} \lambda_j x_j^t \geq y_0^{t+1}.$$

MI measuring the efficiency change of production units between successive period's *t* and *t+1*, is formulated via (5) for measuring the change of technical efficiency and the movement of the frontier in terms of a specific DMU_0:

$$M_0 = \frac{\theta_0^t\left(x_0^t, y_0^t\right)}{\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)}\left[\frac{\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)}{\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right)} \cdot \frac{\theta_0^{t+1}\left(x_0^t, y_0^t\right)}{\theta_0^t\left(x_0^t, y_0^t\right)}\right]^{1/2}, \tag{5}$$

where the *first component* is change in the relative efficiency of DMU_0 in relation to other units (i.e. due to the production possibility frontier) between time periods *t* and *t+1; Second component* describes the change in the production possibility frontier as a result of the technology development between time periods *t* and *t+1*. These specific trends of MI are described in Tab. 3:

Tab. 3 Specific trends of Malmquist productivity index

Malmquist Index	Productivity	Efficiency Change	Technical Efficiency
> 1	Declining	< 1	Improving
= 1	Unchanging	= 1	Unchanging
< 1	Improving	> 1	Declining

Source: Own elaboration, 2013

For elaboration of the empirical part, the software *IBM SPSS Statistics 20* is used, and for solution of DEA method software tool is used in the paper – *the DEA Frontier*.

3. The results of empirical analysis and discussion

The initial hypothesis of efficiency being a mirror of competitive potential *was partly confirmed* through analysis by *Malmquist index*. Some of countries have reached the best results and recorded predominantly *total efficiency increase* through the time period (*Germany, Ireland, Spain, France, Italy, Portugal and Sweden*) and other countries have reached predominantly *total efficiency decrease* during reference years (*Belgium, Denmark, Greece, Luxemburg, Netherlands, Austria, Finland* and *United Kingdom*). According to trends of efficiency change in reference years based on MI, most of countries recording efficiency increase are Scandinavian and West-European EU Member States, but there also two countries from the group of Mediterranean countries. On the other side, most of countries recording efficiency decrease are also Scandinavian and West-European countries and Mediterranean EU Member States. Most of evaluated

countries have recorded both increasing and decreasing trend in efficiency development during reference years of period 2000 – 2011, and some of them have recognized considerable deterioration in efficiency, especially due to economic crisis). Apparently the best results are traditionally achieved by economically powerful countries (SE, DE, FR) which were '*highly efficient*' in comparing years 2000 and 2011. To the group of highly efficient belong also Ireland, Spain, Portugal and Italy, thus countries heavily affected by the economic crisis, but in year 2011 recorded a better ratio of inputs and outputs than in year 2000.

Tab. 4 Results of MI for old EU Member States

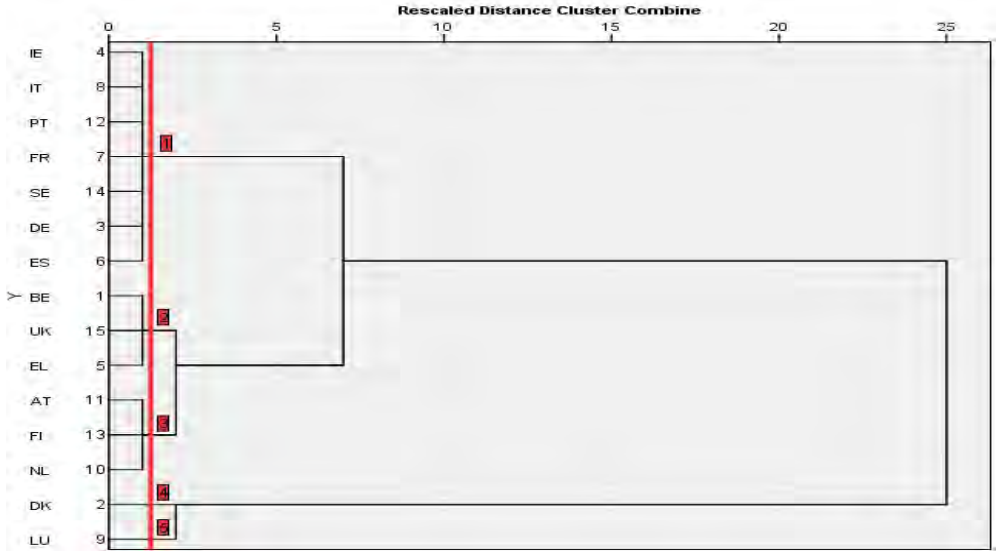
Code		Country/Time	IO CCR CRS MI* – Period 2000 – 2011	Efficiency Trend of MI	Efficiency Change	Frontier Shift
1	BE	*Belgium*	2.1011	↓	1.0000	2.1011
2	DK	*Denmark*	3.1877	↓	1.0000	3.1877
3	**DE**	**Germany**	**0.5208**	↑	**1.0000**	**0.5208**
4	**IE**	**Ireland**	**0.8827**	↑	**1.0000**	**0.8827**
5	EL	*Greece*	1.8973	↓	1.0000	1.8973
6	**ES**	**Spain**	**0.5583**	↑	**1.0000**	**0.5583**
7	**FR**	**France**	**0.8201**	↑	**1.0000**	**0.8201**
8	**IT**	**Italy**	**0.8881**	↑	**1.0000**	**0.8881**
9	LU	*Luxemburg*	4.4015	↓	1.0000	4.4015
10	NL	*Netherlands*	1.5883	↓	1.0000	1.5883
11	AT	*Austria*	1.2779	↓	1.0000	1.2779
12	**PT**	**Portugal**	**0.9121**	↑	**1.0000**	**0.9121**
13	FI	*Finland*	1.3639	↓	1.0000	1.3639
14	**SE**	**Sweden**	**0.7968**	↑	**1.0000**	**0.7968**
15	UK	*United Kingdom*	2.2189	↓	1.0000	2.2189

Source: Own calculation and elaboration, 2013

In Tab. 4, results of *'efficient' countries* are highlighted by bold font. Change of efficiency is caused by the change in the production possibility frontier as a result of the technology development, and by the technical changes. Group of efficient countries is followed by a group of countries which are also *'slightly efficient or inefficient'*. These countries are *Belgium, Denmark, Greece, Luxemburg, Netherlands, Austria, Finland* and *United Kingdom*, they do not achieved best results in efficiency' scores. Their efficiency results (and especially efficiency trend across reference years) were less satisfactory and are considered as countries with lower competitive potential. Some of these countries belong to more (BE, DE, LU, NL, AT, FI, UK) and one of them belongs to less (EL) powerful old EU15 countries. These countries with decreasing efficiency are highlighted by italics in Tab. 4.

Cluster Analysis (CA) is used for defining clusters of countries based on the results of efficiency analysis. The best interpretation of data ensures five-cluster solution in comparison years 2000 and 2011 by MI.

Fig. 1 Dendogram of EU15 countries´ clusters using Ward linkage



Source: Own calculation and elaboration, 2013

Cluster I is created by *Ireland, Italy, Portugal, France, Sweden, Germany and Spain*, which have very similar level of MI and have recognized increasing trend of efficiency development. *Cluster II* is characterized by countries as *Belgium, United Kingdom* and *Greece*, which have recognized worse levels of efficiency scores and have recorded deteriorating trend in efficiency. *Cluster III* represents *Austria, Finland* and *Netherlands*, which have recognized slight efficiency deterioration, but these countries belong to traditional powerful countries. *Cluster IV* is created by only one country *Denmark*, and *Cluster IV* represents also only one country – *Luxemburg*; this is caused by impacts of the economic crisis and in particular the not favourable ratio of inputs and outputs in 2011 compared to 2010. These two countries are among the most competitive EU countries, but other countries recorded the convergence of their performance towards these advanced countries.

Conclusion

Competitiveness and efficiency are complementary objectives, which determine the long-term development of countries. These are also concepts that cannot be avoided in economic theory and practice. Evaluation of efficiency in the context of competitiveness can be performed only if it is used existing concept of these terms or selected mainstream. Because there is no mainstream in evaluation, there is space for alternative approach in this area. Based on efficiency analysis and cluster analysis was partly confirmed the initial hypotheses that countries with better results in MI are more advanced EU15 countries (Scandinavian countries) and having higher level of efficiency, and thus better competitive position in the territory than less advanced EU15 countries (Mediterranean countries). Because of impacts of the economic crisis, results of DEA method and cluster analysis were in EU15 countries comparable, and countries have tended to be naturally grouped into homogeneous clusters belonging both more and less advanced countries. In this paper, MI based on basic IO CCR CRS model has been used

for efficiency analysis in EU15 countries. Provided analysis is based on complete data-base of 62 used indicators divided in groups of inputs and outputs exactly according to CCI concept. This fact could be a prerequisite for further research on evaluation of EU15 counties efficiency by using *factor analysis* to correlation of input and output criteria and to identify *key factors of efficiency* for EU15 countries based on these selected input and output criteria; and then used other DEA models for this more specific data-base.

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Original Altman Bankruptcy Model And Its Use in Predicting Failure of Czech Firms

Abstract

The ability to successfully derive future values of key variables has always belonged with the objects of human interest and has not even avoided the business sector. For several decades, many economists have been trying to find a way how to assess the health of a business as accurately as possible, or predict bankruptcy. This article aims to assess the discriminatory power of one of the most famous and most discussed corporate predictive models, the Altman Z-Score from 1968. The research is focused on four main areas of assessing the discriminatory power of the model. The first part deals with the overall discriminatory power of the model; the second part is aimed at quantifying the impact of individual variables on misclassification of enterprises in bankruptcy. The third part quantifies the discriminatory power of individual variables of the model. The last part compares the classification accuracy of the original model and the modified Altman model which is also adapted to firms not traded publicly. The results are compared with the findings of other authors. The empirical research is based on the accounting data of Czech companies from the manufacturing industry.

Key Words

Altman, bankruptcy, corporate failure, predictive model, Z-score

JEL Classification: G33, M21

Introduction

The first studies focused on the prediction of failure were based on univariate analysis of ratios. These works dealt with a simple analysis of financial indicators, comparing the values of variables of failing and successful businesses. In 1930 the company Bureau of Business Research introduced study, which analyzed the development of 24 indicators in 29 failing companies. The benefit was to identify eight ratios that were considered to be indicators of poor health companies.[8]

The beginning of the real development of research in the area of bankruptcy prediction is dated to the sixties of 20th century, when Beaver [7] published his work. Beaver was the first financial analyst who used statistical techniques for predicting corporate bankruptcies and he identified six financial ratios that are crucial in order to assess the financial health of companies. He also came to the conclusion that multiple analysis of ratios and their connections to one model has a much higher predictive power than analysis of individual indicators. Thus began the era of development of predictive models. In the following years quite a number of other models were published. Altman [3] introduced his multivariate linear discriminant model in 1968; Ohlson [17]

introduced his logit model in 1980. Mr. and Mrs. Neumaier with their indexes IN have been pioneers in assessing the financial health of Czech firms. The last one called IN05 was published in 2005.[16]

The aim of this article is to assess the discriminatory power of one of the most famous and most discussed corporate predictive models, the Altman Z-Score from 1968, especially to quantify the discriminatory power of each variables of the model and its impact on misclassification prediction of companies in bankruptcy. Many authors addressed the discriminatory power of the model as a whole, but not the discriminatory power of the individual variables of the model. The determination of key variables that influence the resulting value of the Z-Score is a necessary step to the correct application of the model and, in particular, to the detection of any erroneous predictions.

Somebody could argue that the original model is not intended for companies which can not determine the real market value of equity. Altman [2] states, even though the replacement of the market value of equity by the value accounting is regarded as incorrect modification, this is one of the most frequent modification of the original model (see chapter 1) and in practice it is often used. It will be interesting in the end of this article to assess whether the orginal model (with mentioned modification) achieves higher predictive power than the model for nonlisted companies on capital market.

1. Altman's Bankruptcy Predictive Model

The best-known version of this model was constructed in 1968. E. I. Altman [3] compared 33 medium-sized American companies (their registered capital amounting to USD 1 – 25 mil.) which ceased to exist with the same number of adequate booming companies. He was the first one to apply multiple discriminant analysis to estimate weights of individual ratios which were included in the model as variables. At first, Altman included 22 financial ratios in his model. He then reduced them only to the five most important. By means of his analytical method he got the following formula known as the Altman´s bankruptcy predictive model or the Z-Score model, which is used for **companies listed at the capital market**:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5, \quad (1)$$

where X_1 = working capital / total assets, X_2 = retained earnings / total assets, X_3 = EBIT / total assets, X_4 = market value of owner´s equity / book value of total liabilities, X_5 = sales / total assets. In our analysis variable X_4 = book value of owner´s equity / book value of total liabilities.

If the score is above 2.99, the firm is healthy. If it is below 1.81, the firm is viewed as failing. Values ranging from 1.81 to 2.99 represent the so-called grey area, when there is no clear prediction.

Practice has proved that the application of the Altman´s Index to predict the business failure is the most reliable two years prior to bankruptcy. The model is less effective and reliable when predicting bankruptcies in the distant future (see Table 1).

Tab. 1 Accuracy of Altman´s Company Bankruptcy Predictions

Number of years prior to bankruptcy	Correct prediction (number of companies)	Wrong prediction (number of companies)	Correct prediction (%)
1	31	2	95
2	23	9	72
3	14	15	48
4	8	20	29
5	9	16	36

Source: [3, p. 604]

After publishing the model, a discussion on how the Z-score model could be used for "nonstock companies" started. Modification of the original model consisted in the total revaluation of the model and the market value of owner´s equity in variable X_4 was substituted with the book value of owner´s equity. In 1977 Altman [1] published the final model applicable to companies **nonlisted at the capital market** and it is as follows:

$$Z' = 0.717\,X_1 + 0.847\,X_2 + 3.107\,X_3 + 0.420\,X_4 + 0.998\,X_5 . \quad (2)$$

Classification ranges for this model have been changed. If the score is above 2.9, the company is healthy. If it is below 1.23, the company is regarded as going bankrupt. Values ranging from 1.23 to 2.9 represent the so-called grey area, when there is no clear prediction. It is obvious that the grey area for this model is wider as opposed to the original Altman´s model.

The original model has been modified in many other ways. Altman adjusted the model in such a way so that it could be applied to emerging markets too.[5]

The reliability of the Altman models has been verified by the author himself and other analysts many times. Russ et al. [19] concluded that the accuracy of the Altman model is sufficient. The model was tested on a sample of several thousands of firms. The resulting Type I error (misclassification of a company in bankruptcy) was 20.6 % and the Type II error (misclassification of going concerns) was 28.4 %. Lacher et al. [14] belongs among next authors who found the accuracy of the modal to be sufficient. The Type I error was 17 % and the Type II error was 4.3 % in their set of firms. In contrast to it, Boritz et al. [10], who assessed the reliability of the model in predicting bankruptcy of Canadian companies, found the predictive power of the model insufficient. The model revealed only 41.7 % of bankruptcies. The predictive power of the model for Czech companies was tested by e.g. Vochozka [21], Maňasová [15], or Kopta [13]. The Czech authors mentioned above came to the conclusion that the Altman Z-Score could unequivocally detect the bankruptcy one year prior to the bankruptcy itself in circa 63 – 73 % of companies. Circa 10 % of companies were erroneously assessed as prosperous.

2. Material and Methodology

2.1 Collection and Characteristics of Input Data

Given the nature of the research, the input data are composed of the financial indicators of selected manufacturing firms. The manufacturing industry has been chosen for its dominant position within the Czech economy. Due to the comparability, firms from other industries have not been included into the analysis. The sample analyzed consists of both prosperous and failing companies. The method of selecting companies corresponds to the selection of enterprises in other professional studies or works.

The group of thriving companies is made up of 47 firms that Čekia, a.s. as well as Coface Czech found successful. An indisputable advantage of these charts is their attempt to assess the overall situation of firms; it is a comprehensive assessment of firms' performance. The rating ČEKIA Stability Award [9] provides an independent view of the financial and non-financial standing of the company. It expresses its current condition, financial situation, including the prediction of future risk. The analyzed flourishing companies took the highest places in the aforementioned charts in 2009 and 2010. For reasons of comparability, a longer period of time was not taken into account. The financial ratios of firms were monitored in the period from 2008 to 2010.

Thirty-eight companies were ranked among those in bankruptcy and their financial ratios for the period of 1 – 3 years prior to the declaration of bankruptcy were monitored. The only condition for including a company in this group was the court decision to declare bankruptcy issued from 2007 to 2011. In order to compare the input data, we did not take a longer period of time into account. The sample of bankruptcy companies was chosen by non-random selection (due to data availability). The bankruptcy manufacturing companies that published the financial statements for observation periods were included in the sample. The data availability, especially for companies in bankruptcy, is very low. The company Creditreform publishes information on compliance of obligation to publish the financial statements by Czech companies. At the end of 2010, only 21 % of limited liability companies and 35 % of joint stock companies saved the financial statements for the year 2009 in Collection of Documents. Czech companies includes to the worst in Europe.[11] The non-random samples of firms are also used in the construction of the predictive models themselves, for example Altman [3][4], Taffler [20], Ohlson [17]. Some authors found that if a failure prediction model is estimated on samples that are non-random it may give inefficient predictions.[6][21] In contrast, Zmijewski [23] found that non-random samples do not significantly affect the overall accuracy rates.

Albertina, the database of firms and institutions, and the collection of documents were the main sources of firms' financial data.

2.2 Methodology for Determining the Discriminatory Power of Variables

The impact of variables on the misclassification of companies in bankruptcy

As the high error rate was not recorded with going concerns, the influence of individual variables on misclassification was analyzed only with bankrupt companies. Companies whose resulting value of the Z-Score is lower than 1.81 (Z<1.81), i.e. they are viewed as bankrupt by the model, are considered to be correctly classified as companies in bankruptcy. Companies that are assessed as prosperous by the model and whose resulting Z-Score is higher than 2.99 (Z>2.99) are considered to be misclassified. Also companies which are ranked in the so-called grey area, i.e. their Z-Score is 1.81≤Z≤2.99, are considered to be misclassified in the period of one year prior to bankruptcy. This condition is based on the assumption that the company predictive model should be able to unambiguously detect failure at least in the period immediately before the bankruptcy itself.

The effect of the *i*-variable on the misclassification of enterprises in bankruptcy p_i was quantified with the use of the following equation:

$$p_i = \frac{X_{i1} \cdot b_i - X_{i2} \cdot b_i}{Z_1 - Z_2} \cdot 100 = \frac{b_i \cdot (X_{i1} - X_{i2})}{\sum_{i=1}^{5} b_i \cdot (X_{i1} - X_{i2})} \cdot 100, \tag{3}$$

where X_{i1} is the average value of the *i*-variable of correctly classified companies in bankruptcy, X_{i2} is the average value of the *i*-variable of erroneously classified companies in bankruptcy, b_i denotes the coefficient of the model *i*-variable, Z_1 is the average Z-Score of correctly classified companies in bankruptcy, and Z_2 denotes the average Z-Score of misclassified companies in bankruptcy.

Discriminatory power of the model variables

Prof. Altman [3] evaluated the discriminatory power of the variable *i-th* by its standard deviation σ_i weighted by the coefficient b_i. However, this assessment may fail in certain situations. This method of assessment assumes that a possible high variability is caused by different values of variables of companies in bankruptcy in comparison with thriving businesses. But that is not the rule. A high standard deviation of a variable caused by a high variability in both groups of companies is not a sign of high discriminatory power, i.e. the ability to distinguish thriving companies from those in bankruptcy. Therefore, it is preferable to choose a similar way as in assessing the influence of individual variables on the misclassification of companies. This method was also used by Taffler [20], and Joy and Tollefson [12]. The relative discriminatory power of variables, r_i, is calculated according to the following equation:

$$r_i = \frac{Y_{i1} \cdot b_i - Y_{i2} \cdot b_i}{T_1 - T_2} \cdot 100 = \frac{b_i \cdot (Y_{i1} - Y_{i2})}{\sum_{i=1}^{5} b_i \cdot (Y_{i1} - Y_{i2})} \cdot 100, \tag{4}$$

where Y_{i1} is the average value of the *i*-variable of thriving businesses, Y_{i2} is the average value of the *i*-variable of companies in bankruptcy, b_i denotes the coefficient of the model *i*-variable, T_1 is the average Z-Score of prosperous businesses, and T_2 denotes the average Z-Score of companies in bankruptcy.

3. Results

3.1 Classification of Companies by Original Model

The following table No. 2 shows the classification of successful companies by the Z model in the individual observed years.

Tab. 2 Classification of prosperous firms by the original Z model

	Average value of Z-Score (Z)	Number of firms		
		Z < 1.81	1.81 ≤ Z ≤ 2.99	Z > 2.99
2010	4.092	2	9	36
2009	4.324	2	8	37
2008	4.352	1	6	40

Source: author's own elaboration, 2012

In the individual monitored years, the model accuracy in classification of the successful firms, i.e. the ability of the model to assess the thriving firms by the Z-Score value higher than 2.99 (Z>2.99), was ranging from 77 % in 2010 to 85 % in 2008. In view of the conclusions of other authors (see the chapter 1) and in view of the fact that an objective business performance criterion cannot be set, we can state that the accuracy of the Z model in classification of thriving companies is sufficient. The majority of firms were classified as thriving or included in the grey zone. Only a negligible percentage of firms were assessed as bankrupt in the individual years. The future development of these firms should be observed. We expect and require the bankruptcy prediction model to be highly reliable especially when predicting bankruptcy. Due to the fact that a group of companies in bankruptcy includes only companies that have been declared bankrupt, it can be expected that at least one year prior to bankruptcy the model evaulate all monitored companies as the company threatened bankruptcy.

Tab. 3 Classification of companies in bankruptcy by the Z model

Number of years prior to bankruptcy	Average value of Z-Score (Z)	Number of companies		
		Z < 1.81	1.81 ≤ Z ≤ 2.99	Z > 2.99
1	0.791	27	9	2
2	1.215	20	8	10
3	2.033	15	4	9

Source: author's own elaboration, 2012

It is evident from Table 3 that the model is less accurate in the classification of firms in bankruptcy than the thriving ones. One year prior to the bankruptcy itself, 71 % of firms were classified as those that were definitely at risk of going bankrupt. Two years prior to

bankruptcy, only 53 % of companies were classified as bankrupt and three years before bankruptcy only 39 % of companies analysed were considered bankrupt.

3.2 The Impact of the Individual Variables on the Misclassification of Companies in Bankruptcy

Table No. 4 which follows illustrates the impact of the individual variables on the misclassification of companies in bankruptcy according to the methodology described above.

Tab. 4 The impact of the variables on the misclassification of companies in bankruptcy (1 year prior to bankruptcy)

	X_1 (WC/A)	X_2 (RE/A)	X_3 (EBIT/A)	X_4 (BVE/BVTL)	X_5 (S/A)	Z-score Z
Misclassification (average values)	-0.058	-0.063	-0.023	0.629	3.293	3.438
Correct classification (average values)	-0.453	-0.281	-0.291	0.011	1.602	-0.287
Z Model – coefficient	× 1.2	× 1.4	× 3.3	× 0.6	× 1.0	$\Sigma X_i \times b_i$
Misclassification ($X_i \times b_i$ coefficient)	-0.070	-0.088	-0.075	0.377	3.293	3.438
Correct classification ($X_i \times b_i$ coefficient)	-0.544	-0.393	-0.959	0.007	1.602	-0.287
Effect of variable p_i(%)	12.725	8.188	23.732	9.933	45.396	

Source: author's own elaboration, 2012

It is obvious from the data in Table No. 4 that all variables reach higher average values with companies that were misclassified in comparison with the correctly classified ones. One year prior to bankruptcy there is the relatively highest difference in average values of the ratio X_4. However, what is really significant for the resulting value of the Z-Score (Z) is the variable value weighted by the coefficient b_i. The variables $X_1 - X_4$ reach low or negative values, so they do not considerably increase the resulting value of the Z-Score (Z). It is evident though that the variable X_3 substantially decreases the resulting value of the Z-score of the correctly classified firms than the misclassified ones. The average values of the variable X_5 of the misclassified companies are above 3 and thus this variable substantially increases the Z-Score value. It follows that the variable X_5 significantly influences the differences in Z-Scores of correctly and erroneously classified companies in bankruptcy and so it has the greatest influence on the misclassification. We would arrive at the same conclusions if we analyzed the influence of variables on the misclassification of firms in the period of 2 and 3 years prior to bankruptcy. Quantification of the variables influence would be similar to the above-analyzed period of 1 year prior to bankruptcy.

3.3 Discriminatory Power of Individual Variables

When assessing the impact of variables on the Z-Score value, it is important for the variable to correctly distinguish bankrupt companies from thriving ones. Therefore, we

will focus on the relative discriminatory power of individual variables. The variable X_4 shows the biggest difference between the average value of thriving and bankrupt companies. However, due to its low coefficient its relative discriminatory power is same in comparison with the variable X_3. Although X_3 shows the minimum difference in average values, it also shows the highest relative discriminatory power thanks to its high coefficient value. In comparison with that, the variable X_5 has higher values for companies in bankruptcy than in thriving companies; thereby it has a negative effect on the Z-Score value. This variable has the lowest ability to classify the thriving and bankrupt companies, and thus the lowest discriminatory power. Table No. 5 illustrates the situation in more detail. In the period of 2 years prior to bankruptcy the relative discriminatory power of individual variables has almost identical values and the order remains unchanged.

Tab. 5 The relative discriminatory power of variables (companies in bankruptcy – 1 year prior to bankruptcy – Y_{i2}, and prosperous companies – year 2009 – Y_{i1})

	$Y_{i1} - Y_{i2}$	$b_i(Y_{i1} - Y_{i2})$	Relative power of variable (%)	Order
X_1 (WC/A)	0.716	0.859	24.310	**3**
X_2 (RE/A)	0.518	0.725	20.524	**4**
X_3 (EBIT/A)	0.389	1.284	36.358	**1**
X_4 (BVE/BVTL)	2.130	1.278	36.182	2
X_5 (S/A)	-0.614	-0.614	-17.374	5
Σ		3.533	100	

Source: author's own elaboration, 2012

3.4 Classification of Companies by Modified Model

It can be assumed that the modified model for companies nonlisted at the capital market (1.2) will achieve higher accuracy than the analyzed model, which is designed for listed companies (1.1). If we compare the results, we find that the accuracy of the modified and original model is comparable for the going companies. But the accuracy of modified model is lower for companies in bankruptcy. 1 year prior to the bankruptcy itself, only 55 % of firms were classified as those that were definitely at risk of going bankrupt. Two years prior to bankruptcy, only 37 % of companies were classified as bankrupt and three years before bankruptcy only 26 % of companies analysed were considered bankrupt. Only 8 firms (21 %) were viewed as bankrupt in all those observed years. These results cannot certainly be regarded as sufficient.

Tab. 6 Classification of companies in bankruptcy by the modified model

Number of years prior to bankruptcy	Average value of Z-Score (Z')	Number of companies		
		Z' < 1.23	1.23 ≤ Z' ≤ 2.90	Z' > 2.90
1	1.078	21	14	3
2	1.356	14	14	10
3	2.086	10	21	7

Source: author's own elaboration, 2012

4. Discussion

The analysis made above has brought several interesting findings. The predictive power of the original model in classification of companies in bankruptcy is rather low. The bankruptcy was unequivocally detected in the period immediately before the bankruptcy itself only in 71 % of cases (in the period of 2 and 3 years prior to bankruptcy the percentage was significantly lower). Many authors hold the view that the reliability of the model is sufficient if the Type I error accounts for 20 % (see the chapter 1). The achieved results confirm the findings of other authors who assessed the predictive power of the model and came to the same results.[15][21]

Another interesting finding is certainly the fact that the modified model for the companies nonlisted at the capital market achieves lower accuracy than the original model (although it should be the other way around). The same conclusions were also reached by other authors. [15][21]

A high value of total asset turnover ratio of companies in bankruptcy is another important finding. The value of this ratio for firms in bankruptcy is even higher than for thriving firms (However, the Z-model assumes that the total asset turnover decreases with the increasing probability of bankruptcy). Some foreign authors in their analysis of variables of foreign firms have come to the same conclusion. Wu, Gaunt and Gray [22] analysed values of selected variables of 887 American companies, which went bankrupt in the period from 1980 to 2006, and compared them with the values of thriving companies. The asset turnover of companies in bankruptcy was 1.35, while of the thriving companies 1.22. Ooghe and Balcaen [18] adapted coefficients of the Altman Z-model to the conditions of Belgian firms. A negative value of the coefficient was assigned to the asset turnover variable, which proves a higher value of this ratio of Belgian firms in bankruptcy in comparison with the thriving ones. In the Prof. Altman‘s set [3] the bankrupt companies had lower values of asset turnover on the average than the thriving firms but the difference was not statistically significant. A relatively high asset turnover of companies in bankruptcy may be caused by an effort of these companies to avert bankruptcy and obtain the necessary financial means by selling its assets.

Conclusion

Several conclusions have followed from the performed research aimed at the analysis of the discriminatory power of the original predictive model of Prof. Altman.

The model accuracy in classification of thriving companies is sufficient. However, the accuracy of the model is low when classifying companies in bankruptcy. The accuracy of the original model when classifying companies in bankruptcy is higher than the accuracy of the modified model, which is designed for companies in our analyzed file (for companies nonlisted at the capital market). This finding may be a topic for further research, which would analyze the cause of this fact.

The asset turnover variable has the most significant effect on the misclassification of companies in bankruptcy. The asset profitability variable also has significant influence. The asset profitability variable has the highest relative discriminatory power (the ability to correctly differentiate companies in bankruptcy from the prosperous ones). On the contrary, the assets turnover variable has the lowest relative discriminatory power. This variable has an opposite effect on the resulting value of the Z-Score.

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Changes in the Rate of Investments in the Czech and Slovak Republics and in High-Tech Manufacturing Industry of Both Countries

Abstract

Competitiveness of the Czech Republic and the Slovak Republic is affected by the use of resources that are available. Neither country has a large area, nor raw-material potential and only a reasonable tourist attraction. Competitive advantage is a need to be built on other sources. The starting point for the economy and most companies is to find a position in customer-supplier chain, which provides high added value.

Macroeconomic competitiveness can be based on quantitative factors (low material and labor costs) or qualitative factors. Qualitatively based competitive advantage must be continuously supported by investments, therefore it is often related to a relatively high investment rate.

Years 2008 – 2010 are and will be associated with the effects of the global economic crisis, which has the consequence of reducing expenditures. Companies reduce costs, particularly where it was possible, significant and did not have an immediate impact. Capital expenditures were thus one of the first items restrained. This article aims to analyze the situation in the economy, which is both very important for the competitiveness of the Czech and Slovak Republics and very sensitive to the need for continuous inflow of investment. The chosen branch is the high tech manufacturing industry.

This paper analyzes the status and development in high-tech manufacturing in years 2008 – 2010 and provides spatial and trend comparison (development is compared in the Czech Republic, the Slovak Republic and the EU-27 average). Indicators compared in the article are relative measures, in order to keep comparability correct.

Article also compares different developments of companies depending on the type of ownership (domestic or foreign owner) and size of the company (small, medium, large). Article seeks to highlight the strengths and weaknesses in needs and assessing of companies, so that they can eventually be purposefully supported in order to get a direct impact on economic growth.

Key Words

rate of investment, gross fixed capital formation, high-tech sector, manufacturing industry

JEL Classification: E22, D21, D24, L60, M21

Introduction

The natural reaction of companies on the economic crisis is to reduce costs and thus reduce investment spending. Instantaneous competitiveness of companies can be seen

in sales (or value added.) Long-term competitiveness of companies and higher performance of economy is conditioned by increasing the investment spending (i.e. gross fixed capital formation). Indicator Investment rate connects capital expenditure with the power companies. At the macroeconomic level it indicates future economic performance. In conditions of the economic crisis, investment rate in the Czech Republic and in the Slovak Republic has fallen, but this indicator has been developing differently since 2010 in the two countries. The decline in investment rate in the Czech Republic is considered to be a negative signal for the future competitiveness of the Czech economy. Analysis at the level of a specific sector can identify concrete factors that participate in the development at the macroeconomic level. This analysis examines the investment behavior of companies in sectors important to the future competitiveness of the economies – in high-tech manufacturing sector. Our analysis shows the different impact of the economic crisis on the rate of investment companies by size and ownership. The analysis also allows to identify the changes inside the sector and also the different adaptation companies on crisis conditions.

1. The impact of economic crisis on the gross fixed capital formation and the rate of investment

The decline in investments in companies at the macroeconomic level is reflected in the national accounts in the change in gross fixed capital formation. In the table 1, we use data from Eurostat (EUR million, current prices) and we present the annual change.

Tab. 1 Gross fixed capital formation (annual change in %)

	2006	2007	2008	2009	2010	2011	2012
Czech Republic	12.3	17.4	15.9	-15.2	5.3	1.1	-1.7
Slovak Republic	15.5	21.6	11.3	-18.5	6.4	15.2	-0.8
EU-27	9.4	9.3	0.5	-15.3	2.1	3.2	-1.5

Source: own processing by [7]

The data in Table 1 show that the investment activity in the Czech Republic and Slovakia in comparison with the EU-27 higher than average. Annual increase of gross fixed capital formation was almost double in the Czech Republic after joining the EU and even more than double in the Slovak Republic than the average growth rate of investment in the EU-27. The economic crisis has caused not only a significant slump in gross fixed capital formation (GFCF) in both countries, but also a significant drop in inventory production. In 2009 the gross capital formation (GCF) decreased by 19.5 % in the Czech Republic, while gross fixed capital formation decreased by 10.2 %. Even the Slovak Republic has registered bigger drop in GCF for the same reason – a huge reduction in inventory. GCF has fallen in the Slovak Republic by 32.5 % year on year, GFCF decline was 21.5 %. The following table 2 shows that in the Slovak Republic, which has moderate economic growth since 2010, the GFCF almost returned to pre-crisis levels (GFCF in 2012 was only 0.9 % lower than in 2008). Czech economy is the only country in the region, which in

2012 suffered a recession [11] – investment activity of companies in this year was, unlike in Slovakia, significantly lower than the pre-crisis year 2008, by 11.3 %.

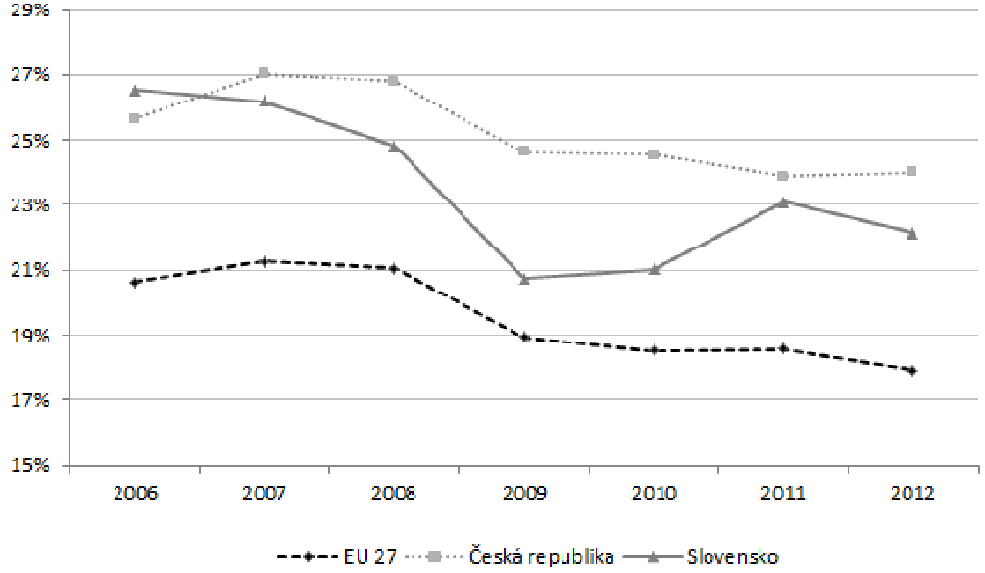
Tab. 2 Gross fixed capital formation (in billions of EUR, at current prices)

	2006	2007	2008	2009	2010	2011	2012
Czech Republic	30.3	35.6	41.3	35.0	36.9	37.3	36.7
Slovak Republic	11.8	14.4	16.0	13.0	13.9	16.0	15.8
EU-27	2413.7	2638.2	2626.0	2225.2	2272.6	2345.8	2311.3

Source: own processing by [7]

The persistent structure of the Czech and Slovak economies (i.e. above-average share of manufacturing industry in the gross value added in the economy, compared with the average for the EU-27) is reflected in a higher rate of investment compared to the average of this indicator for the EU 27.

Fig. 1 Development of the investment ratio (share of GFCF and GDP, in %)



Source: own processing by [7]

Figure 1 shows the negative impact of the recession on the rate of investment in the Czech economy in 2012. Investment rate in the Czech Republic (after dropping in 2009) decreased slightly. In the Slovak Republic, which reported GDP growth after the recession in 2009, the investment rate has increased. Depth of the yearly decline in industrial production in 2012 in the Czech Republic (according to [3] and [4]) has not reached the level of the EU (-2.1 %) and is located close to Germany and Hungary (-0.8 %). The Slovak Republic, which still benefits from completing the expansion of the automotive industry, the industry grew by 10 %. While last year's production of Czech industrial enterprises was located at the level of 2007, Slovakia exceeded the level of pre-recession by ¼. [4]

2. The position high-tech manufacturing industry as part of the manufacturing industry in the Czech Republic and the Slovak Republic

To redirect our economy competitive advantages from cost-orientation to qualitative competitive advantage, innovation performance of firms is a key prerequisite in the high-tech sector. High-tech sector is defined as a set of economic activities for whose production advanced technologies are widely used. At the same time the development of such activities accompanies the high cost of innovation or research and development (R&D). These economic activities also generate higher added value. High-tech sector in the Czech Republic and in the Slovak Republic is defined through Classification of Economic Activities (CZ-NACE, SK/NACE) [1, 8] and is divided into two main categories: high-tech manufacturing and high tech services. High-tech manufacturing industry includes the following activities: manufacture of pharmaceutical products and preparations, manufacture of computers and electronic components, production of consumer electronics and optical equipment, manufacture of measuring, testing, navigating and medical equipment, manufacture of aircrafts and spacecrafts and their equipment. [1, 8]

The first reference period for data processing with the new CZ-NACE and SK-NACE was 2008. While CSO also allows you to monitor data for 2005 – 2007 through reverse conversion of structural data, Slovak Statistical Office only publishes data since 2008. In the following analysis of the rate of investment in high-tech sector, we therefore start from the available data for both countries. This data will allow us to monitor the impact of the economic crisis on conduct of companies in high-tech manufacturing sector in both countries, according to the owner and size.

During the analysis period (2008 – 2010) the position of the high-tech manufacturing industries in the manufacturing industry (MI) is stable (see Fig. 1). Employees of high-tech manufacturing industry accounted for approximately 5 % of the CR staff throughout the manufacturing industry, the share of high-tech MI in sales of MI (sales of own products and services) did not significantly change even in 2009 and has an average of 12 % in the period. The increase in the share of high-tech MI by 1 pp in 2009 caused by lower decline of revenues than in MI (MI recorded revenues decline by 20 %, sales in the high tech MI decreased only by 12 %) and can be regarded as evidence of greater adaptability and competitiveness of the sector in crisis conditions . A similar conclusion follows from the data on the development and sales of MI and high-tech MI in the Slovak Republic. Advanced technology shows a 13 percent revenue share on average for the period. The increase in the share of high-tech MI by 4 pp in 2009 is caused by the decrease in MI sales (down 25 %), while sales of high-tech MI grew by 2.2 %. Even in the case of Slovakia, this result can be regarded as a manifestation of a greater adaptability to crisis conditions. It is also possible to say that the adoption of the Euro had a positive effect on the sales of high-tech MI in the Slovak Republic.

Tab. 3 The position of high-tech manufacturing industries in the manufacturing sector (the share of high-tech MI to MI)

	Czech Republic			Slovakia		
	2008	**2009**	**2010**	**2008**	**2009**	**2010**
Labor productivity (from revenues)	2.01	2.24	2.39	2.38	2.47	3.17
Staff	6 %	6 %	5 %	5 %	5 %	5 %

Note: Revenues from own production and sale of goods in current prices in CZK and EUR

Source: [1, 2, 8, 9]

Table 3 shows that the position of high-tech MI in employment in the MI in both countries is stable. Due to the fact that in both countries the number of employed in MI and high-tech MI decreases (see Fig. 4), the absolute decline in the number of employees in the MI and high-tech MI is uniform. Labor productivity (measured as a share of sales of own products and services and the average registered number of employees) in the high-tech MI more than doubled in both countries. The cause of significant differences in labor productivity is mainly the difference between firms with domestic and foreign owners. Immediately after the introduction of investment incentives, this difference was associated with the effects of foreign direct investment for both economies (the rate of technological flow is conditioned by the ability of domestic firms to absorb these new technologies). In times of crisis it is possible to associate this difference with the fact that the foreign owner due to its position in the value chain and the supplier-customer relations achieves higher market prices than firms with domestic owner. [6]

This view is supported by the following Table 4.

Tab. 4 The position of foreign affiliates in the HT MI (share in %)

	Czech Republic			Slovakia		
	2008	**2009**	**2010**	**2008**	**2009**	**2010**
Staff	68.3	70.0	61.3	73.9	79.8	80.9
Value added	73.6	70.8	59.0	89.9	82.3	92.0
Sales of own products and goods	84.7	90.8	87.4	95.8	97.3	96.8

Note: The value added and sales in bc in CZK and EUR

Source: [1, 8]

Table 4 confirms the above mentioned argument about the position of foreign affiliates in the value chain and the supplier – customer relationships. The share of foreign affiliates in value added in the crisis year of 2009 decreased (in the Czech Republic it also fell the following year – in connection with a decline in the number of large foreign-owned companies in the sector), their share of sales increased. It may mean maintaining access to markets, but at the cost of less effective pricing policy. Another reason may be the more effective management of operating costs.

The higher share of foreign affiliates on the Slovak high-tech manufacturing industry can be explained by the different phases of the life cycle of investments in connection with subsequent massive influx of Foreign Direct Investment (FDI) and the influence of the common currency, which deprives the investor's risk of changes in the exchange rate.

Table 5 shows the annual change in labor productivity and the number of employees in high-tech manufacturing industry and manufacturing industry and describes the impact

of the economic crisis on the environment and high-tech manufacturing industry in both countries.

Tab. 5 Annual change in the labor productivity and the number of employees in the MI and HT MI (in %)

	Czech Republic		Slovakia	
	2008/2009	**2009/2010**	**2008/2009**	**2009/2010**
Labor productivity (MI)	-10.2	+ 25.5	-8.4	+14.7
Labor productivity (HT MI)	+ 1.8	+22.3	+5.3	+15.4
Staff (MI)	-12.5	-2.4	-16.0	-13.8
Staff (HT MI)	-13.4	-8.7	-3.0	-7.8

Note: Labor productivity = revenues from sales of own products and merchandise to employees at current prices in CZK and EUR

Source: [1, 2, 6, 8, 9]

Better adaptability of high-tech MI companies to crisis conditions is evident from the annual changes in labor productivity. In manufacturing, labor productivity declined, high-tech manufacturing industry had a positive impact on the performance of both economies in 2009.

The increase of productivity in high-tech industries in the Czech Republic was supported by a larger decrease in employees than the decline in sales.

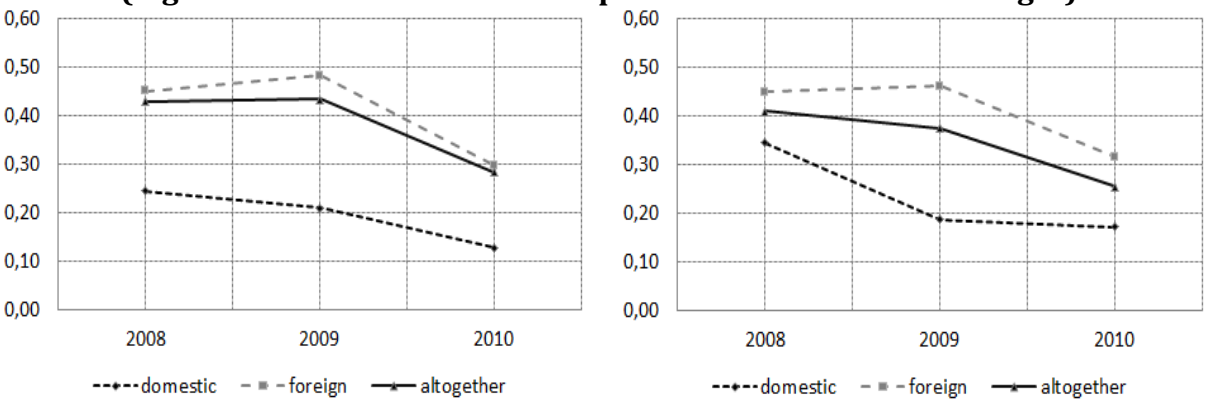
In Slovakia sales increased, although there was a drop of the number of employees (we remind again of the positive effect of EUR – in the form of elimination of transaction costs and exchange rate risks). Recovery, which both economies showed in 2010, led to an increase in sales in both countries with further decline in employment. The result is quite significant annual increase in labor productivity.

3. Changes in the rate of investment in high-tech MI during 2008 – 2010

The development of capital expenditures during this period confirms the fact that these expenditures are the most volatile item of expenditures at the macroeconomic level. Our analysis provides a more detailed view of the changes in the rate of investment in the sector, which is crucial for the future competitiveness of both economies. Differences in rate of investments between firms with domestic and foreign owners and between small, medium and large companies make it possible to identify the different reaction of these companies to the economic crisis.

Figure 2 illustrates the evolution of the investment rate in high-tech MI by the owner, figure 3 the evolution of investment in high-tech companies MI by size.

Fig. 2 The rate of investment by owner
(high-tech sector in the Czech Republic on left and Slovakia right)



Note: The investment rate = gross expenditure on investment / value added, in current prices (CZK, EUR)

Source: [1, 8]

Companies with foreign owners show a higher rate of investment in both countries, and in the Slovak Republic, the share of foreign affiliates in investments in high-tech ZP is higher than in the Czech Republic. Companies reacted to the economic crisis by decline in investment spending.

Because the value added in the Czech firms with domestic owner dropped less, decline in the rate of investment is quite significant. How to explain the slight increase in the rate of investments in foreign affiliates in the Czech Republic and Slovakia? The fall in value added was almost 2 percentage points greater than the decline in investment spending in the Czech Republic (4 percentage points in Slovakia).

Among the companies with home owners, small and medium enterprises dominate in both countries, whose response to the decline in orders is more flexible than large firms. Deciding on investment is not trivial, and if the company is large or has a complicated decision-making structure (foreign affiliates), then there is a rather slow response to the current internal and external conditions. [6]

HT MI contributed with a more significant decline in investment spending (by 33 %) than the decline in value added (by 2 %) to a relatively sharp decline in the rate of investments in 2010 by foreign affiliates in the Czech Republic. Slovak foreign affiliates increased year on year as added value (by 164 %), a capital expenditure (62.5 %) – a decline in investment rates was therefore due to lower growth in capital expenditure compared to the growth in value added.

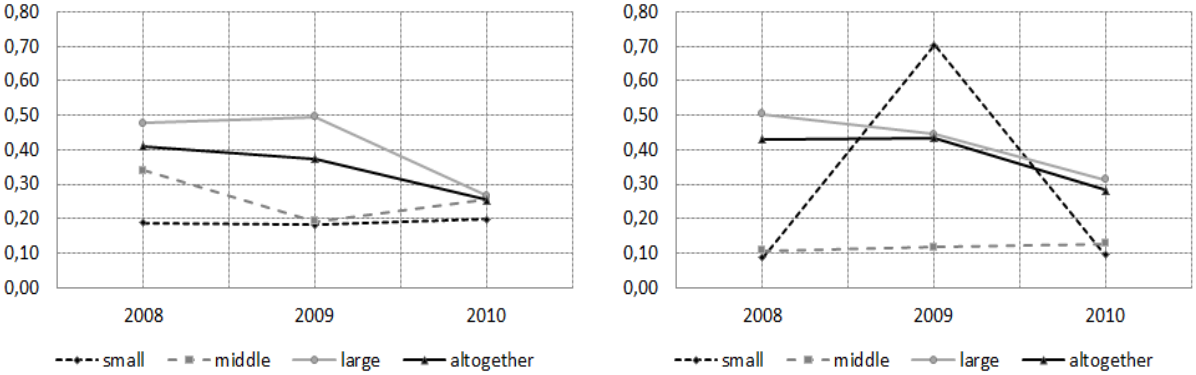
In times of crisis, companies with domestic owners in the Czech Republic reduced capital expenditures more (by 53 %) than value added (by 14 %). In 2010 there was an increase in capital expenditures and value added, but greater value added growth (by 75 %, capital expenditure increased by 60 %) had a negative impact of investments rate.

Companies with domestic owners in Slovakia decreased capital expenditure (in 2009 to 10 % in 2010 to 35 % over the previous year), while the value added grew slightly (5 % and 7 %).

Given the significant share of big companies with foreign ownership in the sector, average investment rate follows the rate of investment in large companies. Significant difference between large firms and Czech average is explained by a smaller proportion of large firms with foreign ownership in comparison with Slovakia (see Table 6). Approaching between the average investment rate and the rate of investment in large firms is due to the increase in the rate of investment in medium-sized companies. In 2009, capital expenditures decreased in all companies (the least, i.e. annually by 16 %, in small companies).

The different developments in the rate of investment was caused by a different drop of value added (the smallest, or 3 %, were in medium-sized companies). In 2010, capital expenditures decreased only in large companies (by 35 %), value added increased in all companies. In Slovakia, there is a positive evolution of investment rate in small businesses with home owners due to the increase in their number in the sector and one-time capital expenditures in this segment.

Fig. 3 The rate of investment by firm size
(HT sector in the Czech Republic on the left and Slovakia right)



Note: The investment rate = gross expenditure on investment / value added, in current prices (CZK, EUR)

Source: [1, 8]

For other companies, the value added decreased more than decreased capital expenditures in the crisis year. In 2010, the annual decline in investment spending (89 %), which was greater than the decline in value added (18 %), participated in the sharp decline in investment rates in small firms. The growth of investment rate in medium-sized enterprises was due to a higher increase in spending on investments (45 %) than the increase in value added (33 %). Decrease in rate of investments of large companies operating in the Slovak HT MI is accompanied by a higher increase in value added (about 201 %) compared with the increase in value added in the Czech Republic (by 112 %).

Conclusion

The aim of the article was to analyze the situation in the part of economy, which is both very important for the competitiveness of the Czech and Slovak Republics and very sensitive to the need for continuous inflow of investment. This industry is high tech

manufacturing industry. Article analyzed developments in high tech manufacturing in the years 2008 – 2010. Comparison of the development and status of the Slovak and EU-27 showed other aspects of the problem. The indicators are relative terms to the comparability correct.

The comparison is a different development in companies depending on the type of owner (owner domestic or foreign affiliates), and size of the company (small, medium, large). The article shows the strengths and weaknesses in needs and appreciation of companies so that they can be purposefully supported with the direct impact on economic growth.

Analysis of selected performance indicators of high tech sector in recession and recovery in the beginning shows the impact of the recession on the company, but also the sensitivity of large firms and foreign affiliates to market fluctuations. On the other hand, we can see both the stability of small and medium-sized domestic companies, but also the flexibility to respond to changing circumstances. When taking into account not only innovation, but perspective in terms of building competitive advantage and other aspects such as the development of human potential and employment in the domestic small and medium-sized firms, we see that these companies are comparable in value added and are not by an order of magnitude smaller employer than the large firms (those are 42 %). In case of any support for building competitive advantages in the Czech economy, support (whether direct or indirect) of domestic companies, particularly medium-sized, should be emphasized, because they have the potential to create product innovation and development of skilled labor.

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Methodology and Method of Economics or Theories of Regional Development

Abstract

The aim of this paper is to present the main methodological approaches and research methods used in the construction of economic theory and formulate conclusions which arise for economic reality. At the same time, the attention is paid to the fact that theories of regional development are constructed on the basis of the same methodological foundations. In recent years, there is noted a significant difference in the development of countries and also strengthening of disparity development within these countries. Moreover, there is an increasing pressure on economic theory, mainly on the growth and development theory to explain the nature of these differences and disparities between countries and regions and to give directions to adequate economic (macroeconomic and regional) policy. Theories of regional development are part of a broad framework of economic theory and prefer spatial and geographic aspects. The methodology can be defined as the study of methods used in scientific research. The method then presents the scientific approach used in examining the phenomena of reality. In this paper, the attention is paid to methodological approaches and methods of classical economics, Keynesian economics, neoclassical economics, neoliberal economics, neo-Marxist economics and institutional or neoinstitutional economics. Within each approach, there are mentioned methods such as historical-inductive method, empiricism, abstraction, axiomatic-deductive method, marginal analysis, methodological individualism, subjectivism, critical realism, dialectics, structuralism, historical approach, praxeology, descriptive analysis and others. The article also includes two schemes. The first presents the basic characteristics of methodological approaches and methods of individual theoretical economic directions. The second scheme shows the main ideas of the authors of theories of regional development in the division as applicable to a particular stream of thought. The author of the article concludes that the future development of economic theory regarding research methods will probably go towards synthesis and complexity.

Key Words

economic methodology, method, positive economics, positivism, realism, individualism, monetarism, Keynesian economics, neoclassicism, neoliberal economics, neo-Marxist economics, institutional economics, theories of regional development

JEL Classification: A1, B00, B22, B41

Introduction

This article aims to highlight the importance of methodology and specific research methods of selected directions of economics and to highlight the fact that based on the same methodological foundations, there are constructed theories of regional

development. Theories of regional development are part of a broad framework of economic theory and arise from the methodological approach of directions of economic thought. However, they prefer spatial and geographic perspective. The aim is not a detailed description of the content of specific theories of regional development, but only a schematic outline of the main ideas of these theories which are built based on the methodological framework of theoretical approaches in economics. Detailed characteristics of regional development theories and their economic and political implications can be found in the Czech economic literature, for example in the book by J. Blažek and D. Uhlíř [2].

For the last few decades, the scientific economic literature (above all, the world) raises a whole series of publications on methodological issues in economics. The most significant authors (in terms of the historical approach), who examined the methodology in economics, for example, were C. Menger, G. Schmoller, F. Machlup, T. Hutchison, L. Robbins, M. Friedman, P. A. Samuelson and many others. From Czech authors, there can be mentioned M. Sojka, J. Pavlík, L. Mlčoch, J. Šíma, M. Loužek, D. Lipka and others.

Methodology can be defined as the study of methods used in scientific research. On the contrary, a scientific method is a procedure used when examining the phenomena of reality. Methodology is a concept in economics which often very loosely means the methods through which economists approach to solve the problem. Sometimes it also refers to the range of issues which a certain group of economists is determined to solve. In the first definition, schools of thought of normative economics and positive economics can be distinguished. Normative economics asks questions of normative type, positive economics is limited to claims that may be verified with regard to the facts.

The second definition of the term enables to identify schools of thought that seek different types of questions and use different analytical procedures. For example, representatives of neoclassical economics are principally engaged in the problem of allocation of existing resources, while using other specific theoretical approaches, concepts and instruments. Keynesian economics emphasizes the use of a macroeconomic approach [10, p. 208][1].

An interesting perspective on the methodology of economics is given by R.F. Harrod in his article from 1938: "*In the choice of subject to-day [scope and method of economics], I fear that I have exposed myself to two serious charges: that of tedium and that of presumption. Speculations upon methodology are famous for platitude and prolixity. They offer the greatest opportunity for internecine strife, the claims of the contending faction are subject to no check greed, and a victory, even if it could be established, is thought to yield no manifest benefit to the science itself. The barrenness of methodological conclusions often is a fitting complement to the weariness entailed by the process of reaching theme. Exposed as a bore, the methodologist can not take refuge behind a cloak of modesty. On the contrary, he stands ready forward by his own claim to give advice to all and sundre, this criticism the works of others, which, whether valuable or not, at least attempts to be constructive, he sets himself up as the final interpreter of the past and future dictator of efforts.*" [4, p. 383]

1. „A bit of“ philosophy

Meeting basic human needs is a multidimensional and at the same time a fundamental problem of human existence and coexistence of human population in the broadest sense of the word since its very inception. Especially with the growing awareness that can be defined as "*the exclusively highest human form of reflection of objective reality ... but* [it] *can not be equated with knowledge and logical thinking*" [5, p. 508] and awareness of people and the development of science, especially social, answers to fundamental questions on the social and (within this) economic development and at the same time economic growth are increasingly sought. The replies of sociologists, historians, economists and specialists in other social sciences are not in opposition and can be complemented in many ways.

Considerable expansion of a wide range of theories of regional development occurred in the second half of the 20th century, especially with the constant deepening of differences of economic development, and therefore the standard of living between regions within countries. "*Regions, or states as the original subjects of analysis, are not unchanging units but rather living organisms whose needs logically develop*." [6, p. 181] Currently, there are a number of methods for measuring regional disparities, however exploring these measurement methods does not always lead to unambiguous conclusions. Still, these measurements show clearly that on the basis of empirical research in recent decades inequality between the most developed and on the contrary underdeveloped regions, or more precisely between rich and poor income groups, has been proven.

These facts only correspond to the question of “how” individual economies or regions develop in terms of a simple quantitative comparison. The important question is “why” there is such difference. It's a matter of pointing to the very substance of knowledge and its phenomena and manifestation. The substance can be generally understood as a set of “depth” properties, relations and internal laws defining the main features and trends of the investigated system. Phenomena are then specific events, properties or processes expressing the outside of reality, or a form of an expression of a certain substance. Substance and a phenomenon are always closely related. There is no substance that would not manifest itself and was uncognizable, just as there is no phenomenon that would not contain information about the substance. The nature and effects do not coincide, they are not the same, and substance is hidden beneath the surface of phenomena. The more "deeply hidden" it is, the more difficult its theoretical knowledge is and takes longer.

Cognition of substance is possible on the basis of abstract thinking and creation of a theory of the investigated process. During cognition of substance, it is moved from external identification and description of a phenomenon to its clarification, to discover its causes. One of the criteria of substance cognition is the possibility to predict future events based on well-defined laws of their changes. The substance can be considered as identified if there are known causes and sources of development of examined object, found its way of the formation (or technical fabrication); if its plausible model, whose characteristics correspond to the original, is designed in theory (or practice).

If it can be said that the nature of the problem is identified, it is necessary to justify and clarify the causes of previously formulated laws about the substance, hence why the laws are just that and not another substance, what determines the meanings of their parameters, borders of effectiveness, etc. Substance is always more stable compared to the phenomenon, the phenomenon is moving and changing. However, the substance of all systems and processes are amended in accordance with the general historical development [5, p. 361].

Upon receipt of such a conception of substance and its phenomena, these concepts may be applied to economic issues, or regional development. If external phenomena are identified, such as uneven economic development expressed by appropriate generally accepted quantitative indicator or indicators, it is necessary to study the causes, find the patterns and determinants, that means the very substance of these dissimilarities.

The role of science, creating theories and designing models, the way and principles of their work is succinctly described by the following quote: "*The aim of science and scientific knowledge in general should be to clarify the nature of phenomena and explain their causes. However, the reality that surrounds us is often too complex and heterogeneous to be grasped and satisfactorily described within a single theory or model. Ever since ancient times, and even with greater intensity since the Enlightenment, science has tried to deal with the problem which represents a never-ending process of creation of theories, their comparison with the facts, revision and formulation of new theories. The theory is the basic form of organization of scientific knowledge, a kind of organizational tool that allows us to illuminate an area of reality to explain its relation to the other. The methodology is then a science that examines the way and the basic principles governing the creation of theories and research methods, as well as the basic premises from which the theory of creation arises; and this is also an indispensable guide for the evaluation of theories.*" [2, p. 21 – 22]

2. Methodology and methods of research of main schools of economic thought

2.1 Classical schools of political economics

A completely new way of economic thought entailed the emergence of the classical school of political economics which was enforced by social and economic changes of that time. Classical economics is built on the basis of the philosophical framework J. Locke, D. Hume and the French Physiocrats and their natural laws. The basic politico-philosophical orientation of classical school is then liberalism based on the idea that society and the economy are the natural order, which was in sharp contrast to the mercantilist doctrine. The aim of the classics was the justification of the need of an economic system based on free market competition and free trade. The subject of their investigation is the question of the creation and distribution of social wealth, that is, basic macroeconomic issues.

Classical political economics meant the constitution of economics as a science. The effect of Petty's political arithmetics, particularly in the works of Adam Smith is reflected in the effort to document his claims with historical and factual material. A historical-inductive method is typical for Smith.

For economics as a science a method of abstraction is typical. It is the basis of the design of theories of economic thought in the so-called mainstream economics. This method was used by D. Ricardo in his core work where he first built a strictly logical and highly abstract model as a basic tool of economic analysis. He laid the foundation of nowadays axiomatic-deductive economics. Ricardo managed to create an analytical system built on the axiomatic basis from which theorems, describing simplified, thus axiomatically analyzable macroeconomic relationships, were derived by deductive logic. A drawback of this method, however, was the inability of analysis of difficult measurable quantities, such as the effect of institutions, historical traditions or philosophical-ethical consequences that were a normal part of Smith's work. Despite many critics of Ricardo´s methodological approach, it can be said that he gave a plausible picture of the economy and economics in its conception became an exact scientific discipline.

The words of S. Dow will enable to transfer the attention to methodology and method of marginalists. "Deductive method, which was pioneered by Ricardo, stimulated, under the influence of marginalist revolution, narrowing of a disciplinary coverage and transformed political economics into 'economics'; Ricardian economics was yet in its entirety, with the advent of marginalist at turn of the century, heavily overshadowed. While Ricardo initiated a change of a methodological accent, marginalists initiated a change of the methodology itself." [3, p. 54] The degree of continuity between Ricardo and marginalists is still the subject of academic debate nowadays. In the early 19th century, A. Marshall was a proponent of this connection.

2.2 Neoclassical economics

Neoclassicism was a new theoretical economic system that is inherently very different from classical economics. The link of the classics to the neoclassics was represented by liberalism or an assumption of internal stability of the economic system.

The marginalistic revolution evolved in three directions. The English branch (A. Marshall) focusing on utility theory and the theory of partial equilibrium maintained some elements of the classical school. Especially in France and Italy another branch wins its way, general equilibrium school whose main representatives were L.M. Walras and V. Pareto, advocates of a strict formalistic approach. The third branch is represented by the Austrian school that advocated the subjectivist approach maintaining a strongly critical attitude to empiricism.

In the last third of the 19th century, marginalists built the concept of "*homo economicus*" into economics. This is the concept of rational optimizing individuals, Ricardian deductive method is further deepened and improved and economic theory gradually opened to mathematical methods and graphical analysis. The microeconomic character

of neoclassical economics is closely associated with methodological individualism that is based on the idea that for understanding the effects of individual behavior, it is necessary to know the principles of behaviour of these individuals.

Whereas the classical economists were primarily oriented to growth (dynamics) of national economies and the distribution of gross income, the leaders of neoclassical economics focused mainly on the analysis of the allocation of scarce resources and creating economic equilibrium (static concept). During the 20th century, the formation of neoclassical macroeconomics gained its importance together with the construction of growth models built on the basis of Cobb-Douglas production function [for details see 9] became increasingly important. With the development of neoclassical economics, there is even more intensive use of mathematical methods. The methodology of neoclassical economics is the determining methodology of the so called mainstream economics.

2.3 Keynes and Keynesian economics

In 1936 J. M. Keynes published his General Theory of Employment, Interest and Money. The fundamental problem that he solved was high unemployment. Keynes fully rejected the basis of neoclassical macroeconomics in the form of Say's law of markets according to which the balance in full utilization of resources was automatically restored. He criticized underestimation of the role of money as storage of values and the concept of investment as deferred consumption. He also refused the neoclassical labor market equilibrium based on the perfectly flexible real wages and marginal working burden. Keynes pointed to the inflexibility of wages and inferred causes of involuntary unemployment. A significant contribution of Keynes's approach compared with neoclassical economics was the fact that he incorporated elements of uncertainty and expectations into economic analysis. Keynes also initiated the separation of macroeconomics from microeconomics and empirical research in macroeconomics. These were the elements that led to the weakening trend of favoring common neoclassical axiomatic-deductive methods in economics.

Keynes's theory represented a turning point in the development of macroeconomics. It was also a prerequisite for building a new paradigm in economics. In mainstream economics, however, the neoclassical interpretation of Keynes's theoretical legacy in the context of the neoclassical synthesis succeeded. This synthesis became the defining trend in the further development of Keynesianism after World War II until the mid 70´s.

Neoclassical economists are trying to prove that Keynesian economics is only a special case of the general neoclassical theory. This interpretation is based on the application of traditional neoclassical methodological foundations based on a closed system of axiomatic logic and related to the basic assumptions of rational economic man and perfectly competitive markets in Walrasian concept [12, p. 57]. In particular, Hicks, Modigliani and Pigou reinterpreted Keynes's work in neoclassical terms.

Post-Keynesians lay emphasis on the area of Keynes's work which represents a departure from the classical theory. On the contrary, neo-Keynesians and new

Keynesians understood Keynesian theory as a supplement and development of Marshall Theories and mainly highlight continuity between Keynes and Cambridge neoclassical theory.

Post-Keynesians in accordance with Keynes left the methodological individualism of neoclassical economics. For methodological individualism, consistent deducing of macroeconomic terms in accordance with the rational behavior of microeconomic entities was typical. Keynes understood the man as a social man who is in his decision-making and behavior, among others, influenced by social psychology and social conventions. He sought to analyze the effects of decisions of economic agents (households and firms) entering into mutual interactions. In Keynes´s methodological approach, there are events with different speed and behaviour of subjects may change in response to certain events. V. Chick says: "*What created Keynes, was a kind of uneasy compromise between the method of comparative statics and considerations on dynamics of economic processes."* [12, p. 90]

In terms of methodological approach, Keynes and then post-Keynesian thinking is an example of critical realism whose basic characteristics is a departure from the theoretical models built on axioms and building thoughts on realistic abstractions. A typical example is Kaldor's Stylized Facts. The analysis of economic phenomena in this concept may lead to different, but equally valid approaches to the understanding of the same phenomenon. For this methodological approach, it is characteristic to adopt the existence of incomplete knowledge and qualitative cognition which does not allow quantification. An example is then Keynes's Theory of Uncertainty and Investment Behavior. Critical realism in the given concept then did not only lead to considerable heterogeneity of post-Keynesian theories, but also to a more realistic analysis of contemporary developed market economies.

2.4 Neo-Marxist economics

Neo-Marxist theoretical approaches were gaining importance in the context of the economic recession in the early 70´s of the 20th century. Neo-Marxists base and further elaborate methodological and economic-philosophical approach of Karl Marx. Marx´s thought that all economic systems create conflicting forces and then undergo radical changes, is derived from Hegel's philosophy. The basic method of thinking of Marxists and neo-Marxists therefore became Hegelian dialectics. Neo-Marxists perceive the capitalist economy as an inherently unstable system, which results in uneven economic development in both the global economy and in various regions of the country. In their theoretical framework, they build the theory of real global change of the capitalist system and at the same time try to apply Keynesian approach. Another important feature of the neo-Marxist theory is the collective concept of human and a historical approach. Structuralism is typical for neo-Marxists. Among other things, when examining a particular object, it assumes the process from the initial arrangement of the observed facts to the identification and the description of the internal structure of an object in order to create a theoretical model and its interpretation. This method is applied by neo-Marxists primarily in the area of social structures.

In terms of content, the priority of representatives of this school of thought is to reveal fundamental problems of capitalist ownership, production and social relations. A significant drawback is the absence of their corresponding socio-economic model. Neo-Marxists are supporters of demand-oriented theories of economic growth.

2.5 Neoliberal economics

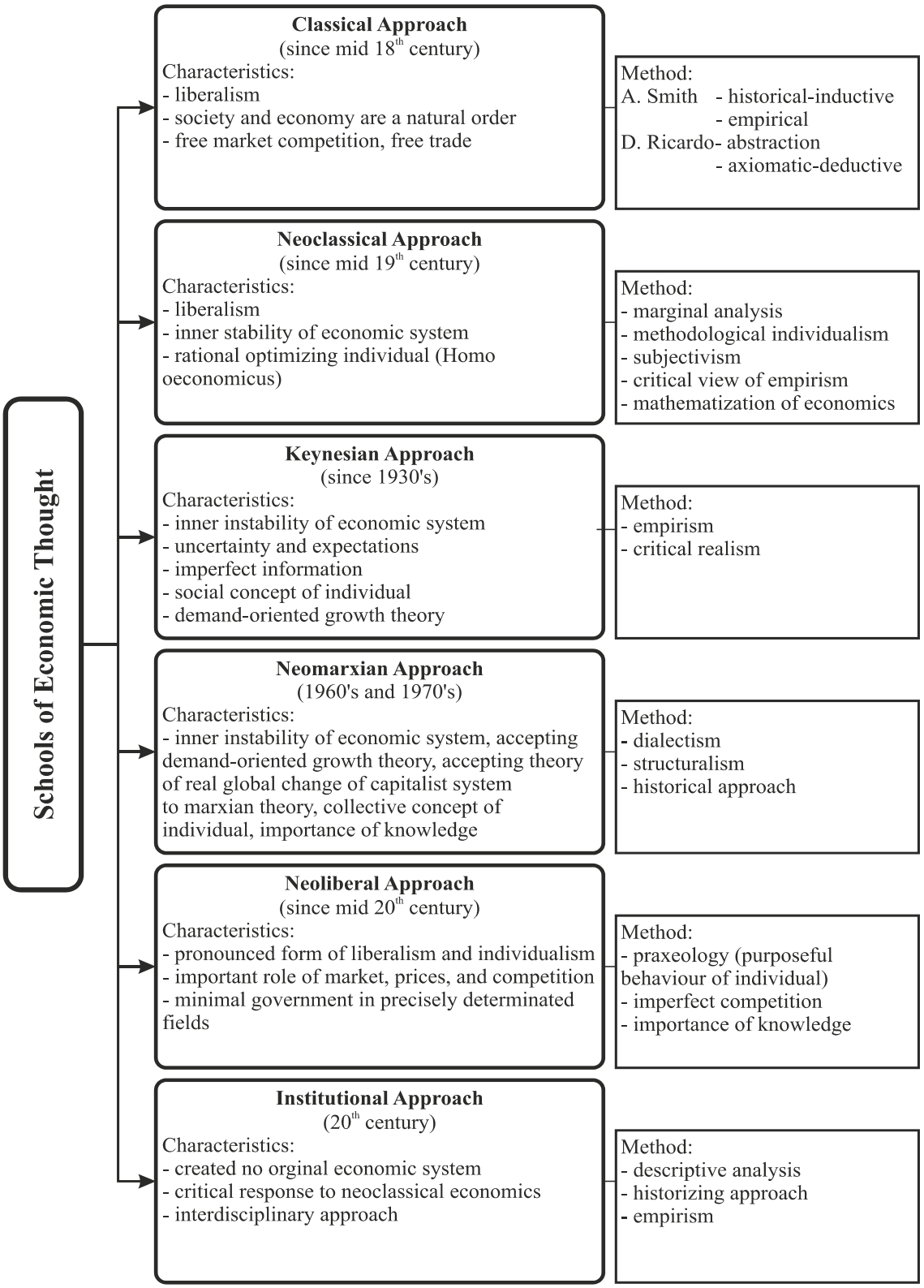
Neoliberal economics has developed since the 50´s of the 20th century and is associated with efforts to create macroeconomic theory, which is built on the microeconomic foundations of neoclassical economics and is seen as the opposite of Keynesian macroeconomics. It gained a considerable importance in the 70´s in relation to economic problems in market economies of that time where the outcome of some theories became the basis for economic policy making. Neoliberal economics is a relatively broad term that includes mainly Friedman's monetarism, Lucas' theory of rational expectations, Buchanan´s public choice theory. Austrian School also belongs to neoliberal economics.

„*Milton Friedman got known in the economic public because of his strong opinions on methodological issues in economics. His scientific work stems from methodological individualism as well as the Neoclassical Economics and Austrian School. He was an advocate of methodological positivism to prove the verity of hypotheses. His opinion was significantly influenced by the non-positivism philosophy, particularly the Karl Popper work.*" [8, p. 8] According to Friedman, positive economy must fulfil four basic conditions: internally logical consistency and using terminology, which has meaningful equivalents; the theories must be empirically tested. Further, the only theory significance test is the conformity between the forecast and the economic reality. Because more theories can be in conformity with the economic reality, additional criteria are necessary to be added, e.g. simplicity and experience.

The main point of Friedman's methodological positivism is the following hypothesis: the aim of the theory is to provide correct forecast. It is not essential to test the groundwork, but the conclusions. This approach is completely different compared with the methodological realism of post-Keynesian economics which focuses on realism of theoretical conditions. Friedman affirmed that hypotheses are not important (it is never possible to include all the factors, which determine the phenomenon); in case the conclusions are in accordance with the reality, the theory could be declared relevant because it explains reality [8, p. 8].

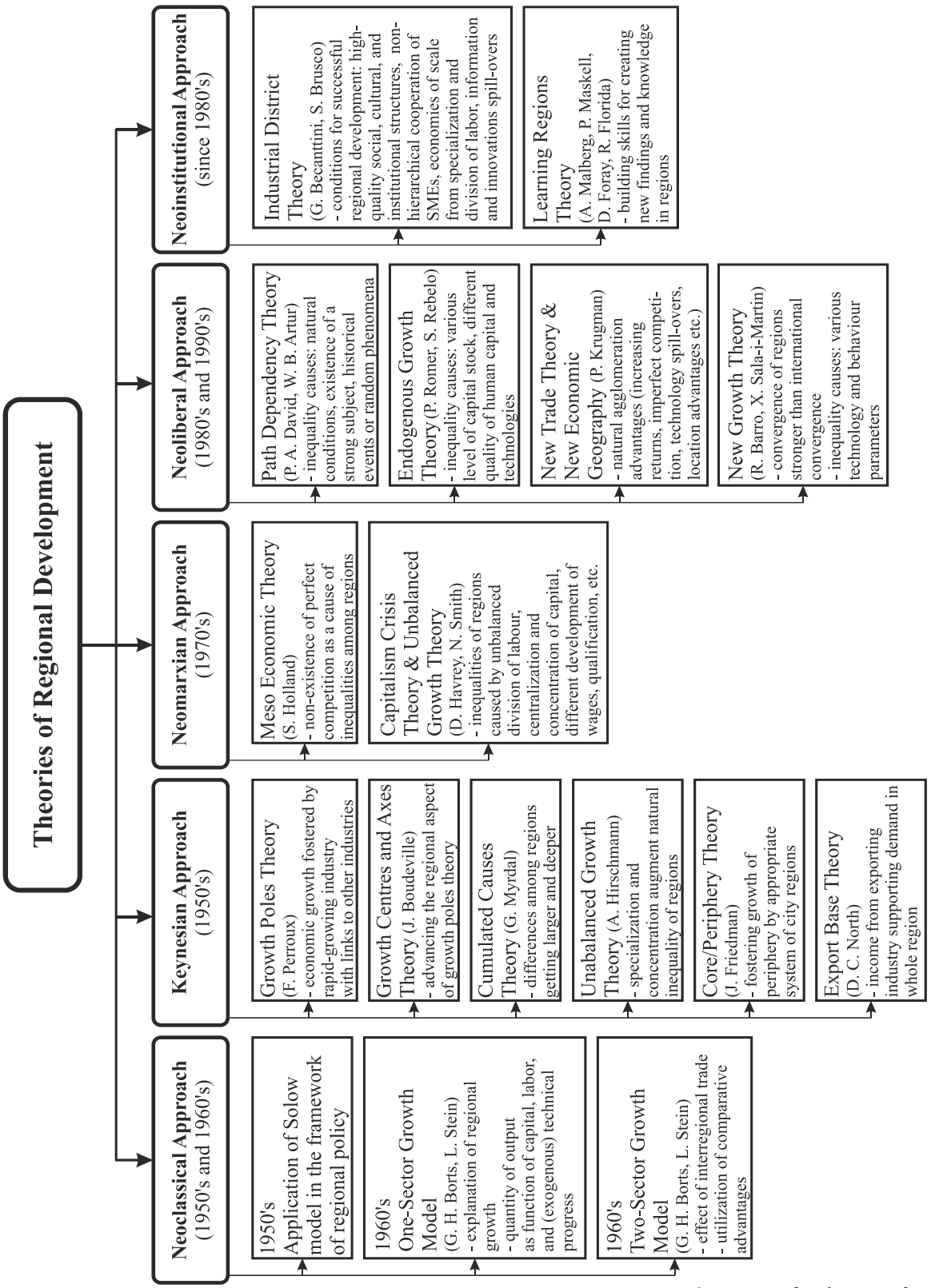
Generally speaking, the neo-liberal theories are a clear-cut form of liberalism and individualism. The emphasis is placed on the role of market prices and competition in the economy. For the advocates of this line of thought, it is a priority to minimize the influence of the state in precisely defined areas of economic life. Methods used in the research are the above-mentioned positivism, empiricism and praxeology.

Fig. 1 Schools of Thought – Methodology & Methods



Source: author´s own scheme

Fig. 2 Theories of Regional Development



Source: author´s own scheme

2.6 Institutional and neoinstitutional economics

At the turn of the 19th and the 20th century, there occurred the origins of institutional economics, neoinstitutional economics came at the end of the 60´s of the 20th century. Institutionalism is highly heterogeneous socio-economic line of thought whose representatives refuse abstract deductive method of neoclassical economics and disagree with its detachment from economic reality. They critically view the positivist approach of neoclassicists and reject methodological individualism. Man is understood in his social and cultural context. Market is perceived as a social institution whose efficiency is subject to specific institutional arrangements. The aim of institutionalists is "integration of economic theory and other social sciences creating conditions for the interdisciplinary study of socio-economic phenomena and processes and search for sources of socio-economic evolution in institutions that were of different specification." [13, p. 208] Institutional economists did not create their own consistent system of thought.

Neoinstitutionalists or representatives of the school of transaction costs work on the assumption of methodological individualism contrary to the "old" institutionalists. In their interpretation, it was the addition or modification of traditional neoclassical economics built on the model of rational behavior. They use mathematical formalization and construct theoretical models. As Roncaglia states: "*In sub-stance, neo-institutionalism may be considered as yet another case of neoclassical synthesis: the problem of institutions, traditionally tackled with historical-sociological analyzes, is brought within the field of the theory of rational behavior of maximising economic agents.*" [11, p. 479]

Individual theoretical economic approaches, their basic brief characteristics and methods of research are summarized in Figure 1 ‘Schools of Thought – Methodology & Methods’.

3. Theory of regional development

The range of classifications of theories of regional development is very broad. These theories often draw on and are closely linked with economic theories, or their methodology and research methods. From this perspective, there can be traced five basic theoretical concepts within the theories of regional development and regional policy. It is a neoclassical, Keynesian, neo-Marxist, neoliberal and neoinstitutional approach. Regional development theories focus on the identification and subsequent search for effective tools for removing or mitigation of regional disparities. Their content is economic development and economic growth examined in terms of space and location.

At a higher level of abstraction, it is possible to narrow this view on two basic orientations. The first one is based on the neoclassical and neoliberal paradigm. The regional approach emphasizes natural convergence trends in the development of regions in the long term period. Regional disparities are regarded as a result of natural

evolution which is determined by a number of specific features of the given region. Regional differences are seen as a possible stimulus for activation of "its own (regional) forces." This approach inherently rejects the intervention of the state.

The second approach, divergence theory, is based on Keynesian (or post- and neo-Keynesian) and neo-Marxist economic theory. The substance of regional differences is seen in the functioning of the market economy as such. Market, according to this theoretical approach, cannot regulate itself, which leads to the creation of economic imbalance with the consequences especially in the social area. It is an approach justifying the need for state interventions in the economy. Then "*Regionalism as part of the state economic policy focuses on the use of regional comparative advantages and enhances its resistance using a regional context.*" [7, p. 65]

As mentioned above, a detailed explanation of the theories of regional development in the framework of theoretical economic objectives is given in the book by J. Blažek and D. Uhlíř. The aim of this paper is to point out the methodological and methodical basis of economic theory and theories of regional development which are identical. Figure 2 'Theories of Regional Development' shows a brief description of main leaders of the current economic theories of regional development.

Conclusion

Any economic theory, if it is adequate in solving a specific problem, must first perfectly know the very essence of the problem. Furthermore, solutions make their way using appropriate research methods. From this brief outline of the development and characteristics of the methodology and methods of theoretical approaches, it is evident that economics is a kind of base for further economic-scientific discipline including theories of regional development. Theories of regional development are separate subdiscipline of economics and have, in a broad sense, the same principle topic and the same theoretical and methodological issues.

In the classification of economic theories, in terms of the methodology used and the methods of investigation, there can be traced five basic theoretical approaches, that is neoclassical, Keynesian, neo-Marxist, neoliberal and institutional. This classification is also applicable to theories of regional development.

It is possible to state that Keynesian theory (not only original, but also its modern trends) provides space for the assembly of new or newly identified phenomena in their model framework. The benefit of this theory was the abandonment of methodological individualism of neoclassical economics and the adoption of critical realism (post-Keynesian), which is characterized by a departure from the theoretical models built on axioms and building considerations on realistic abstractions. Such a methodological approach allows accepting the institutional, political, scientific, and other factors.

Future development in economic theories is likely to go towards the synthesis and complexity. In recent years, the view of "development as growth" is again coming into

focus of some economists and economic policy makers in particular who repeatedly appeal to growth theory to explain the nature of differences and disparities between countries and regions and to give instructions to the appropriate regional policy.

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Corporate Social Responsibility in the Context of Banks' Competitiveness

Abstract

In October 2011 the European Commission published a new policy on corporate social responsibility (CSR). The modern understanding of CSR is perceived as a necessity of integration of social, environmental, ethical, consumer concerns and human rights into their business operations and core strategy in close collaboration with their stakeholders.

In case of banking institutions this concept can be treated as an opportunity to gain competitive advantage. The main aim of the article is to present the idea of corporate social responsibility as a tool for supporting competitiveness of banking institutions. In this contribution there have been indicated the key areas of CSR influence on banks competitiveness and related benefits. Positive influence of CSR on bank's competitiveness can occur in the following key areas: enhancing public image and reputation, ethical behaviors, improving relations with employees, strengthening community involvement, building environment responsibility image and improving organizational governance.

According to Banking of Sustainability Report, 2005 IFC Sustainability Survey of Financial Institutions shows that 68 % of commercial banks indicate improvement of credibility and reputation as the main reason why banks engage in social and environment activity [19]. In several economic studies [33, 10] corporate reputation is directly linked with its competitiveness, while reputational risk is one of the main risks which endanger its stability and financial performance. In this context, CRS strategy occurs as one of the effective solutions allowing to gain many different benefits for banks. It seems that being socially responsible, understood as taking into account not only own interests (e.g. profit maximization) but also interests of other stakeholders, behaving fair and responsible to them, can be viewed as a significant element of acquiring competitive advantage.

Key Words

improving banks' competitiveness, corporate social responsibility, competitive advantage

JEL Classification: M14, G21

Introduction

Banking system development over the centuries has contributed to taking over more and more tasks connected with financial activity of households and enterprises. It causes that banks used to perform many crucial functions for the whole economy. Maintaining efficient payment system, providing the financing sources of companies' current activity and investments as well as satisfying individuals' demand for credit, banks have become the crucial element of every contemporary economy system.

Considering performing function as well as its serving role for the whole economy, banks have enjoyed the status of public trust institution for years. Whereas, trust is important for almost every company's existence, for banks it is indispensable because they are depended on constant inflow of deposits, which constitutes the main source of its financing. Confidence loss, which often goes along with turbulences on financial markets, constitutes a real threat for banks survival. Banks deprived of deposit inflow or credits from interbank market are endangered – without lender of last resort assistance – to loss of liquidity or even, in long-term, their solvency. Therefore, confidence is said to be an essential condition of banking system stability.

The financial crisis, which had occurred on subprime credit market in United States and spread over the almost whole global economy, undermines confidence to banking institutions and their image of public trust institution. Unethical banks activity on financial markets, which in broad sense are viewed as being responsible for crisis, causes a loss of its position as a responsible, fair, trustworthy and reliable institution. The crisis took roots in irresponsible credit policy through granting credits to clients without creditworthiness, what resulted from bank concentration on short-term financial results, instead of taking into account its long-term stability. The significant financial pain imposed on many households and companies arose from the fact that these risky credits were sliced and repacked via securitization into complex financial products that were also sold back, directly or indirectly, to consumers as saving and investment products [23]. It contributed to complete confidence loss to banks, leading to eroding its image as reliable institution and perceiving them as "public distrust institution". According to Edelman Trust Barometer [11] after financial crisis outbreak for many next years, banking industry has been representing the least trusted sector.

Taking into consideration the confidence crisis on financial markets, one of the most important challenges for banking system is restoring trust to banking institution and regaining their position as a responsible business partner. The importance of responsibility was emphasised by President Obama statement, who said that "what is required of us now is a new era of responsibility".

In the face of losing bank's image as a public trust institution, implementing corporate social responsibility strategy, can constitute a starting point for restoring confidence to the banking system. Whereas, initially corporate social responsibility was treated more as an element of public relation or marketing stunt than companies' overall strategy, nowadays to a greater extend it is becoming every-day reality and possible factor to reach the competitive advantage. The main aim of the article is to present the idea of corporate social responsibility as a tool for supporting competitiveness of banking institutions. In this contribution the key areas of CSR influence on banks competitiveness and related benefits were identified.

Paper contains a deep summary review about CSR approach and describes influence of CSR on bank`s competitiveness. In the article has been used the method of analytical and critical approach to literature reference sources.

1. The idea of CSR in the banking industry

In October 2011 the European Commission published a new policy on corporate social responsibility, in which the Commission puts forward a new definition of CSR as "the responsibility of enterprises for their impacts on society". The modern understanding of CSR perfectly expresses the following statement: "To fully meet their social responsibility, enterprises should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders with the aim of:

- maximizing the creation of shared value for their owners/shareholders and for their other stakeholders and society at large;
- identifying, preventing and mitigating their possible adverse impacts" [13].

Previous Commission's approach to CSR is reflected by definition in COM(2001)366 [9], where CSR is perceived as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis". By renewing definition of this concept Commission aims to create conditions favourable to sustainable growth, responsible business behaviour and durable employment generation in the medium and long term.

By World Business Council for Sustainable Development CSR is viewed as "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" [34].

According to ISO 26000 social responsibility reflects to the "responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour that: (1) contributes to sustainable development, including health and the welfare of society, (2) takes into account the expectations of stakeholders, (3) is in compliance with applicable law and consistent with international norms of behavior, (4) is integrated throughout the organization and practised in its relationships" [20].

The International Institute for Sustainable Development (IISD) defines in turn that "corporate social responsibility promotes a vision of business accountability to a wide range of stakeholders, besides shareholders and investors". As the pivotal issues IISD perceives environmental protection and the wellbeing of employees, the community and civil society in general, both now and in the future. IISD puts the emphasis on the fact that traditional views about competitiveness, survival and profitability are being swept away [17].

Discussion about CSR in the banking industry involves frequently a problem of the conflict between a social responsibility and a profit maximization. The questions arise if these two terms aren't contrary or if bank will be engaged in the socially responsible activity replacing its traditional goal – profit maximization. According to Ch. Ceil's article

[6] modern organizations should be more concerned with corporate social responsibility rather than focusing on wealth maximization only. The author claims that making the maximum possible profits for the shareholders is the commercial objective and it can be termed as the leading motivation for business practice.

The Millennium Poll study involving over 25,000 citizens across 23 countries on 6 continents shows that in recent years the community expectations for companies have been changed expanding scope of responsibilities by including apart from making a profit, paying taxes, creating jobs and obeying all laws also setting higher ethical standards and helping build better society [12]. In this context the corporate social responsibility plays an important role for organizations. This concept highlights the fact that core business may be profit maximization but business ethics requires responsibility for making such profits [6].

This situation can be observed in banking too. The expectations for banking institutions have been changed. Currently banks have to consider not only economic, but also social and environmental aspect of their performance. Relating to these changes, CSR reflects the crucial responsibility of banks in contributing to sustainable economic development while they were striving towards achieving profit maximization [21].

Despite the fact that corporate social responsibility is useful in almost all types of organizations, in banks it has to rise an additional challenge as they have to meet various, often contrary interests of specific groups of stakeholders, both internal and external. On the one hand banks have to take up financial risks in order to maximize profits to shareholders, while on the other hand depositors expect to limit excessive financial risks and maintain optimal liquidity in order to ensure safety of banking activity.

That means that the idea of sustainable development and social responsibility can be understood as a value system that says a bank's commercial activities must not only benefit its staff and shareholders, but also its customers and the wider economy, while at the same time preventing, or at least minimizing, any undue effects on society and the natural environment [18]. Implementing social responsibility management into banks activity involves their commitment to: the economy, shareholders, customers, employees, society and environment [4].

Responsibility to the economy is connected with supporting growth and development of the real economy and its selected sector. It is based on the bank's role as a financial intermediary, offering its clients diverse products and services thus satisfying its financial needs. Commitment to the economy expresses itself also in the necessity of complying with regulatory and supervisory's legal norms. Another aim of bank activity is to create shareholder value. Within this goal, shareholders are mainly interested in achieving satisfactory rate of return, ensuring internal control in order to increase effectiveness, providing effective risk management and improvement of corporate governance. Bank customers as external stakeholders, expect improvement of products and services quality, enhancing innovation, establishing efficient customer service and intensifying customer relationship management. While taking care of employees

involves creating the opportunities for career development, improving their work-life balance as well as corporate culture development.

Responsibility to society includes banks' engagement in undertakings related to different spheres of life like education, environmental protection, scientific and technological innovation and culture [4]. Bank activity in the area of environment protection focuses on contributing to green economy development through supporting clean energy end ecologically friendly and energy-efficient sectors, and involves promoting all initiatives connected with environment protection behaviors.

According to ISO 26000 there can be distinguished the key areas, which simultaneously define the scope of corporate social responsibility, which are as follows: organizational governance, human rights, labour practices, the environment, fair operating practices, consumer issues as well as community involvement and development.

2. The benefits of CSR and its influence on banks' competitiveness

The necessary condition for the success in the financial market is the maintaining bank's competitiveness. Competitiveness should be perceived as not only as the ability to operate and survive in a competitive environment, but also an ability to offer such products and services (or even creating demand for them) which will allow the bank to achieve satisfactory financial results despite difficulties and constraints resulting from the nature of market operations [22].

Gorynia [15] points out that there are three main dimensions (areas) of competitiveness, which are as follows:

- competitive potential (competitive ability, competitive potential – which includes all resources, which can be used in entity's activity),
- competitive strategy (instruments of competition such as quality of products, price, size of product range, advertising, sales promotion, entity's image or brand, etc.),
- competitive position, which is result of competitiveness,

As the result of implementing competitive instruments, which constitutes the elements of competitive strategy, entity has an opportunity of gaining and maintaining the competitive advantage. In general, competitive advantage is gained when organizations perform better than their competitors in the same industry. In order for organizations to outwit competition and succeed in the market place, they must possess some kind of advantages compared to their rivals [27].

Competitiveness constitutes a multidimensional term, which can be perceived both at micro and national level. Analyzing the impact of CSR on bank's competitiveness, there has been applied firm (micro) level approach. Some other studies show that CSR can

also make a significant positive contribution to national competitiveness [5], which can be understood as "the ability of a country or location to create welfare" [2].

The importance of CSR concept was confirmed by putting it on the list of the objectives in the Europe 2020 strategy for smart, sustainable and inclusive growth [12]. Relating to the contribution of I. Boulouta and Ch. N. Pitelis [5] it is hard not to agree with the observation that business world today – and the banks institutions too – faces increasing pressure to adopt or improve CSR. The authors indicate that this pressure has both a moral and a strategic imperative. The moral imperative is mainly based on the argument that businesses have obligations not only to their shareholders, but to multiple stakeholders too, while the strategic imperative is based on the statement that CSR can improve the competitiveness of firms.

Ch. Cei notes that traditional CSR was perceived as a form of philanthropy to improve an individual's welfare or as an instrument to supplement the government's efforts in service delivery, while the modern view refers to the effects of this activity to organizations [6]. Relating to the approach to CSR which was fragmented and disconnected from business and strategy M. E. Porter and M. R. Kramer note that if corporations were to analyze their prospects for social responsibility using the same frameworks that guide their core business choices, they would discover that CSR can be much more than a cost, a constraint, or a charitable deed—it can be a source of opportunity, innovation, and competitive advantage [29].

Recently there have been many different studies which analyze potential positive effects that allow to consider CSR as a concept generating valuable resources contributing to improving companies' competitiveness, understood as a situation when organizations perform better than their competitors in the same industry. In practice CSR includes many different actions and the effects of this activity to companies may differ. Crucial areas of CSR influence on banks' competitiveness and related potential competitive advantages are presented in tab. 1.

Positive influence of CSR on bank's competitiveness can occur in the key following areas: enhancing public image and reputation [8, 28, 26], ethical behaviors [14], improving relations with employees [25], strengthening community involvement, building environmental responsibility image and improving organizational governance [3, 8, 7].

According to Banking of Sustainability Report, 2005 IFC Sustainability Survey of Financial Institutions shows that 68 % of commercial banks indicate improvement of credibility and reputation as the main reason why banks engage in social and environment activity [19].

Taking into account that in today's competitive environment, financial survival is challenged to achieve customer satisfaction [3], positive bank's reputation can be critical for customer decisions and has direct impact on its interests in bank's products.

Tab. 1 CSR as a source of banks' potential competitive advantages

Crucial areas of CSR influence on banks' competitiveness	Potential benefits for banking institutions
Public image and reputation	Enhancing public image and reputation thus contributing to increase demand for banking products and services (image can be critical in tipping customers decisions); building customer loyalty and long-term relations; supporting consumers' confidence; engaging in consumer protection (e.g. through products and services transparency); limiting the risks of potential conflict situations between bank and its clients derived from bank's products and services; reduction the need of investment in advertising and publicity activities in the media because CSR can be viewed as passive publicity (lower cost of publicity)
Ethical business practices	Strengthening positive perception of banks (by clients, investors, business partners) through responsible lending and borrowing; building actions, procedures and processes transparency; improving management quality by reducing risks, costs of conflicts with various groups in a society; avoiding fines and sanctions; improving the reliability and fairness of transactions through responsible investment policy, fair competition, and the lack of corruption; improving relations with regulators and supervisory authority
Relations with employees	Higher banks' ability to recruit and retain high quality staff; improving banks' ability to reach the objectives through better motivated staff; enhancing employees' loyalty and morale; increasing staff productivity as a result of banks' better care of employees and their families (providing good work-life balance, pensions and health-care benefits); increasing employees' engagement in looking for new opportunities and limiting risks (concern for job satisfaction that contributes to creativity and innovativeness); creating responsible employer image by: avoiding any form of discrimination (sex, age, disability), freedom of association and friendly working environment
Community involvement	Exploring the opportunities for developing innovative products and services supporting sustainable consumption patterns and lifestyles that contribute to societal wellbeing; extending customers base through attracting unbanked and economically disadvantaged part of society (young, elderly, unemployed people); improving relations with community and local governments; strengthening socially engagement image (e.g. by supporting charitable activity or involvement in community education through running foundations)
Environment	Waste reduction (better management of energy or materials) that supports costs saving; building reputation which attracts environmental sensitivity investors; commitment to environment responsibility may result in business innovations which can constitute long-term benefit; invested in an alternative energy; supporting ecologically-friendly initiatives; opening to new clients (green markets)
Organizational governance	Better management of processes; effective use of resources which creates opportunity for increasing productivity in the long-run and has a positive influence on financial performance; building strong reputation for socially responsible behavior which puts a bank at an advantage when negotiating deals and attracts socially responsible investors resulting in financing stability improvement in long-term horizon and potential lowering cost of capital; enhancing management quality by more informed decision-making according to society expectations and risks reduction; keeping consistent stakeholders dialogue is in a more favorable position to anticipate and attend to regulatory, economic, social and environmental changes that may arise which enhances ability to manage change; respect for the rules of law, socially responsible reporting

Source: own study on the basis of literature review [19, 20, 5, 27, 16].

Consumer choices have strong impact on company's success, which means that good reputation strengthens a positive perception of bank's products encouraging customers to buy it. Additionally, it enables to attract more clients thereby increasing their customers base, among other things, through banking inclusion of young, elderly or unemployed people by offering them products and services, which meet they special needs [32].

Research studies underline the positive effect of improved company reputation as a result of CSR initiatives on demand for its products. Collado-Munoz and Utero-Gonzales [8] support that view pointing out that as a result of CSR initiatives, banks are able to obtain a better strategic position in the market together with higher profit margins and higher demand due to positive consumer perceptions. Their empirical analysis confirms that consumers take into account other features different from the price, such as social contribution or closer service to make their financial decisions. Good bank's reputation remains the critical issue for supporting stakeholders' confidence, which is said to be one of the most important bank's assets. On the contrary, bad company reputation can lead to boycotting its products causing dramatic drop in demand.

Undertaking customer-oriented CSR initiatives is crucial in building its customer loyalty, which constitutes factors of significant importance of company's business success. In order to be successful in the marketplace, company must be able to maintain a good and long-term relationship between them and their clients, as this will lead to repeat purchases and eventual customer commitments [28]. Such customer's commitment is possible on the condition of their satisfaction from products and services. Moreover, client satisfaction and responsible policy of selling financial products can limit the risks of potential conflict situation between bank and its client derived from bank's products and services. Good reputation is creating not only through activities for consumers, but also for other groups of stakeholders (e.g. employees, local community, general public, regulatory authority, investors or business partners).

The observation of banks' activity in Poland proves that modern banking institutions have been implementing CSR in their business operations and strategies in recent years. One of the popular type of practical activities constitutes initiatives aimed at raising financial awareness and education level. Banks intend to prepare participants of these programs to make beneficial, justified and correct financial decisions supported by adequate knowledge of various products, detailed rules of their functioning or types of risks associated with personal finance management, also covering savings accumulation. The analysis of projects carried out in this area by Polish banking institutions in 2012 indicates active involvement of Bank Handlowy in Warsaw. The initiatives conducted by this bank are which follows:

- My finance – the aim of the project is preparing young people to make rational and individually beneficial financial decisions, supported by the continuously updated knowledge;
- The first million (online game) – the aim of the project is education related to finance and entrepreneurship addressed to different social groups (middle school students, secondary school students, university students and adults)

- Developing Financial Independence among Women – the aim of the project is extending knowledge, raising competencies and skills in personal finance management related to reasonable usage of loans and credits offered by banks, household budget management and financial future planning for women affected by violence and abuse
- From a class to a cashbox – the purpose of 4th edition of the competition was to familiarize the above primary level students with principles underlying the functioning of basic capital market instruments, stock exchange mechanisms and savings accumulation problems.

According to Zadek, business can compete effectively across the responsibility spectrum, spanning the investment in environmentally-friendly technology and raising productivity by improving their employees' work-life balance [35]. In the narrow sense, measures of competitiveness at the firm level therefore comprise indicators of financial performance, such as the development of sales, profits, and costs, as well as stock performance [36]. Indicated benefits create an opportunity to improve bank's financial performance which supports the view that being responsible can pay off [7]. Despite the fact that the majority of studies prove the positive impact of CSR on the banks' competitiveness it should be stressed that some authors indicate no significant or negative relationship.

Conclusions

Ch. Cei states that "it is for the best interests of an organization to practice CSR" and emphasizes that this concept allows firms to do well by doing good [6]. The significance of this statement is confirmed by BSR/GlobeScan Survey conducted in 2011 on a sample of 498 professionals from BSR member organizations from around the world. Results of the survey show that more than 8 in 10 firms (84 percent) are optimistic that global businesses will embrace CSR/sustainability as part of their core strategies and operations in the next five years. Respondents indicate that main drivers of public trust, business leadership, and ongoing success are as follows: increasing the transparency of business practices (55 percent); measuring and demonstrating positive social and environmental impacts (51 percent), and creating innovative products and business models designed for sustainability (42 percent). Moreover, another survey indicates that in the face of rising global competition, over 90 % of CEOs see sustainability as critical for their company's competitiveness and future success [24, 1].

"Sustainability has become an essential element of competitive advantage and something businesses can no longer ignore" [19], especially in the light of dramatic loss of confidence resulted from recent financial crisis. Therefore, this concept can be perceived as an effective tool for strengthening competitiveness in banking institutions in the context of improving reputation and rebuilding its image as public trust institution.

The challenge is not so much to „find" profitable opportunities in today's markets, as to create markets (in societies) that systematically reword responsible practices [35].

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Utilization of Modern Management Methods with Special Emphasis on ISO 9000 and 14000 in Contemporary Czech and Slovak Companies

Abstract

Extent of utilization of modern management methods (systems) in companies is important indicator of advanced and mature management. There exist dozens of modern methods focused on different branches of management as strategy, production, quality and more. Department of management and entrepreneurship on Business Administration Faculty of Silesian University in Opava conducted three rounds of questionnaire research, called "Adaptability of entrepreneurship", where besides others, utilization of management methods in companies, as activity preventing managerial misguiding, leading into entrepreneurship failures and bad economic results, were evaluated. There were addressed these 16 methods: ISO 9000, ISO 14000, EFQM, TQM, BSC, KPI, EVA, Porter's 5 forces, SWOT, BCG, SMART, PEST(LE), MBO, 6-sigma, Kaizen and Lean. Respondents ware further encouraged by open question to add more methods, they use. Approximately 700 valid questionnaires were collected back and evaluated during 2nd round of research in the year 2012. The data group was segmented by branches using NACE classification. There was determined what methods are most utilized with regard to ISO 9000 and ISO 14000 implementation and furthermore correlation map (using SPSS software) was created, characterizing, what management methods are implemented mostly together, with potential synergic effect. Results are interpreted, discussed and compared with professional literature.

Key Words

management methods, management systems, ISO 9000, ISO 14000, questionnaire research, Czech and Slovak enterprises

JEL Classification: D22, L15, M11

Introduction

There exist many different management methods and even complex management systems that were developed during more than last century of capitalist establishments, particularly in Europe, North America and Japan. This plenty of management methods can be categorized into management branches as Economy & Finance Management, Facility Management, Informatics & IT Management, Human Resources Management, Logistics & Transportation, Organizational Management, Marketing & Sales, Production Management, Quality Management, Crisis Management, Innovation Management, Process Management, Service Management, Project Management, Risk Management,

Change Management, Knowledge Management, Strategic Management, Security Management, Planning, Organizing, Leadership & Communication, Decision Making, Control and more [5].

The questions remain in existence: What management method or system to employ or utilize into company processes? What systems are efficient? Every entrepreneur and management needs to answer these questions by their own. Goal of this paper is to bring at least partial answer how do deal with modern management systems and methods contemporary Czech and Slovak enterprises and if some management methods tend to cluster in practice of these companies.

1. Theory and hypotheses

Prior to launching the questionnaire research we considered thoroughly what management systems or methods we should ask about the CZ and SK companies, to indicate their knowledge and involvement into utilization of modern management methods. The different points of view were taken in account: general familiarity, complexity, specificity, branch of company activity, type of enterprise and more. Equally we were aware that finite, process-able number of methods has to be selected. Finally there were selected 16 seemingly incoherent following systems/ methods to input into questionnaire:

1. **ISO 9000 family** (ISO 9001) is part of a family of international standards issued by the ISO (International Organization for Standardization). Standard ISO 9001 is not a management method, it is standard or norm, which serves as a reference model for setting the basic management processes in an organization that continuously helps to improve the quality of provided products or services and customer satisfaction (that's why quality management system).
2. **ISO 14000 family**. ISO 14001 is the world's most recognized and used for environmental management systems. This standard requires the organization to identify all environmental impacts and related aspects of its business. In addition, it defines the objectives of environment and introduces measures to improve performance through process improvement in areas of high priority.
3. **EFQM Excellence Model** also used in short version EFQM Model. The EFQM Model was developed by the EFQM Foundation as a framework for the implementation of quality management methods in the organization.
4. **TQM** (Total Quality Management) is a very complex management method that puts emphasis on the quality management in all dimensions of the organizational life. It goes beyond quality management and it is also a method of strategic management and it is a management philosophy for all of the organization activities. There are many different forms and interpretations of TQM.
5. **BSC** (Balanced Scorecard) is a system of management and measurement of the performance of the organization, which is based on defining a balanced system of interrelated indicators of business performance. Hence the "balanced". Balanced Scorecard was developed by American consultants Robert S. Kaplan and David P. Norton in the nineties of the 20th century.

6. **KPI** (Key Performance Indicators) is a term that refers to the performance indicators/metrics associated with the process, service, organizational unit or the entire organization. KPIs reflect the desired performance (quality, efficiency or economy).
7. **EVA** (Economic Value Added) is a term that refers to the currently very important valuation measurement of the enterprise performance. The basic idea of the indicator is that invested capital has to have a greater benefit that the cost of this capital.
8. **Porter's 5 forces** is the work of Michael E. Porter. It is a way of analyzing the industry and its risks. The model works with the five elements (Five Forces). The principle of this method is a forecasting of the development of the competitive situation in analyzed industry, based on the estimate of the potential behavior of the subjects and objects involved in a given market and forecasting of the risk of imminent business
9. **SWOT** analysis is an universal analytical technique focusing on the evaluation of internal and external factors affecting the success of an organization or any other evaluated system. Most often, SWOT analysis is used in the strategic management of an organization in the evaluation of a strategic intention. The author of SWOT analysis is Albert Humphrey, who designed it in the sixties of the 20th century.
10. **BCG** Matrix (Growth-share matrix) is a method that comes from the consulting company Boston Consulting Group (BCG). From here comes the name BCG matrix or Boston matrix. The BCG matrix is used for the evaluation of the organization's product portfolio in marketing and sales planning.
11. **SMART** is an analytical technique for designing objectives in management and planning. SMART is an acronym from the initial letter of the English names of the objective attributes (Specific, Measurable, Achievable/Acceptable, Realistic/Relevant, Time Specific/Track-able)
12. **PEST(LE)** analysis is an analytical technique used for the strategic analysis of organizational surroundings. PESTLE (sometimes also PESTEL) is an acronym and each letter represents a different type of external factors (Political, Economic, Social, Technological, Legal, Ecological)
13. **MBO** (Management by Objectives) was designed by Peter F. Drucker as a method based on setting and mutual agreement of the objectives and evaluating the success of their achievement. The task implementers are allowed to decide which method is most appropriate to achieve the objective. It is a delegation of responsibility for the objective to the implementer. The method is applicable in virtually all management fields.
14. **6-sigma** is a complex method of management and, like Lean it is known more as a philosophy that the organization (enterprise) must take. It is focused on continuous improvement (innovation) of the organization by understanding customer needs, using the process analysis and methods standardization in the measurement. It is a comprehensive, flexible management system that is based on understanding customer needs and expectations, on disciplined use of information and data to management and decision making.

15. **Kaizen** is a method of gradual improvement based on cultural traditions of Japan (the word itself comes from the Japanese). The improvement focuses on the gradual optimizing of the processes and work practices, quality improvement and scrap reducing, material and time savings leading to cost reduction, work safety and reducing workplace accidents.
16. **Lean** (or Lean Management) is a very broad management method. The term philosophy that the organization (enterprise) must accept is most often used in the connection with Lean. Lean is based on several basic principles. Primarily it is the effort of the organization to continuously improve in all areas and to avoid unnecessary wastage. The second principle is the best possible customer's needs satisfaction, no matter how. Lean is often used with different attributes; depending on what fields this philosophy is applied [2], [4], [5].

Main emphasis was placed on ISO 9000 and ISO 14000 consequences as follow-up of already published research [8], [9], [10] and further relations with other management methods were tested. There were formulated three main hypotheses:

- H1: ISO 9000 and ISO 14000 are predominantly implemented in branches of Manufacturing and Construction.
- H2: Most enterprises do not utilize any modern management method or system.
- H3: It is possible to notice groups or "clusters" of management methods with mutual correlation, which are implemented jointly.

2. Original research and its methodology

Questionnaire research was realized during spring semester 2012 by students of Business Entrepreneurship Faculty in Karvina, Silesian University in Opava (Czech Republic). 722 companies active in Czech and Slovak Republic in time period 2009 – 2011 were subjects of interest (SMEs are creating 89 % of sample group in accordance with number of employees' criterion). Interview protocol included controlled dialogue of a student with an enterprise owner, an executive manager or a top manager, so the collected data have the character of expert guess opinion. Company identification (10 questions) and identification of a student and his opinion on questionnaire relevance (5 questions) was necessary part of each form. Initial sample size 722 companies were filtered and reduced to 677 credible items. The questionnaire form also includes nondisclosure statement to provide business and privacy protection. Moreover data were analyzed anonymously and published as only no-name data.

Data reliability is assured (1) by authorization (contact person, signature, stamp), (2) by subjective student relevance evaluation, partially (3) by internet verification and (4) by statistical validity (standard deviation and Pearson correlation index).

Questionnaire was focused on seven areas of interest (2 of 61 questions evaluated):

- Enterprise identification (1 of 10 questions evaluated)
- Enterprise´s strategic management (1 of 6 questions evaluated)

- Economic and financial trends of business, risk management (11 questions),
- Personal politics of company (7 questions)
- Production, services and innovations (8 questions)
- Grants and subsidies (4 questions)
- Energetic and material savings and application of renewable sources (8 questions)
- Sustainability priorities of enterprises (7 questions)

There were evaluated following questions/criteria in presented paper. Numbering of questions correspond the one used in the questionnaire. Each part had space for possible comment or further narrative information about questions asked.

Enterprise identification:

- A5: Major branch of economic activity according NACE classification (A – U codes)

Enterprise´s strategic management

- B17: What modern management methods do you know and use? (ISO 9000, ISO 14000, EFQM, TQM, BSC, KPI, EVA, Porter's 5 forces, SWOT, BCG, SMART, PEST(LE), MBO, 6-sigma, Kaizen, Lean and other – open question)

Data were processed by Microsoft Excel® and IBM SPSS® software. Figures and tables are presented and commented in the next part of article. Discussion with other published related scientific results is presented later.

For the reason of comparison analysis data were structured into four data evaluation groups (except for all data group):

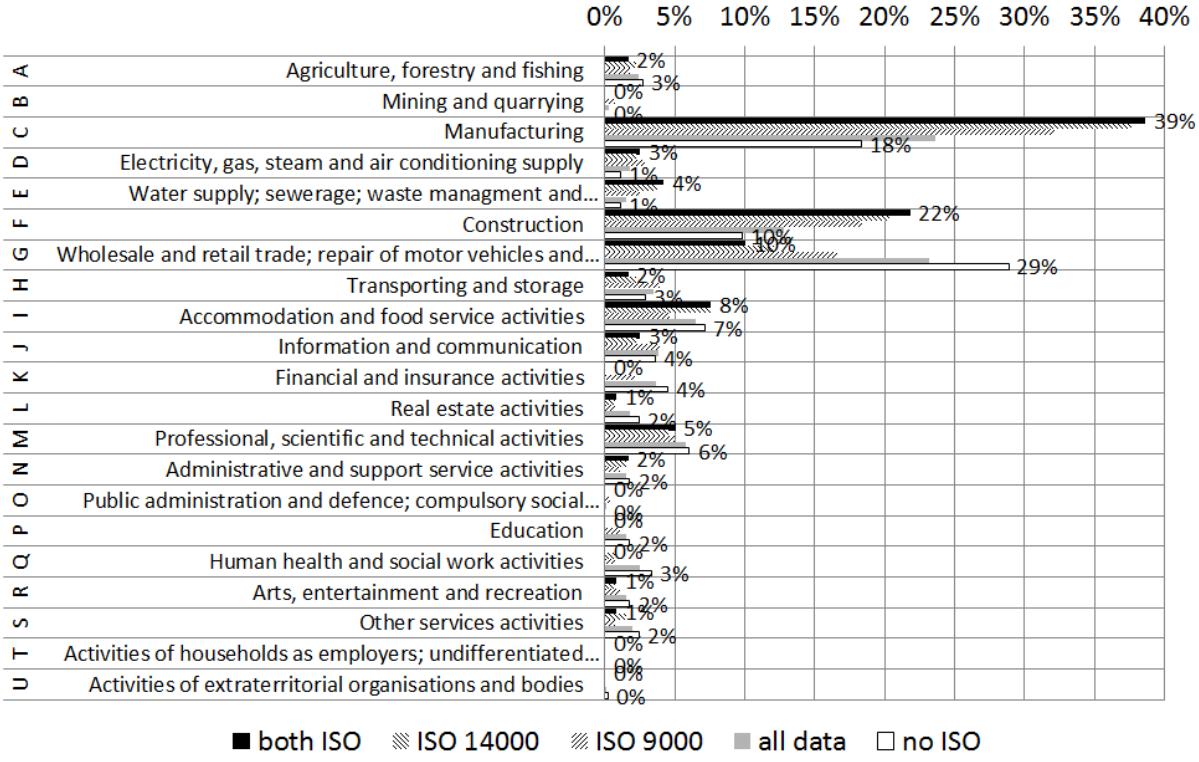
- Enterprises with neither ISO 9000 nor ISO 14000 implemented (414 enterprises) constitute 61 % of all data group.
- Enterprises with ISO 9000 implemented (249 enterprises) constitute 37 % of all data group.
- 42 % of companies with ISO 9000 have also ISO 14000.
- Enterprises with ISO 14000 implemented (121 enterprises) constitute 18 % of all data group.
- 88 % of companies with ISO 14000 have also ISO 9000.
- Enterprises with both ISO 9000 and ISO 14000 implemented (107 enterprises) constitute 16 % of all data group.

3. Findings and results

The following chapter presents most important results concerning utilization of management methods of Czech and Slovak companies. Figure 1 characterizes relation between implementation of management systems ISO 9000 and 14000 and branch of economic activity according NACE classification. Figure 2 characterizes application of

different management methods with relation to implementation of management systems ISO 9000, 14000 and table 1 clarifies furthermore that relation. Figure 3 shows correlations between applications of different types of management methods.

Fig. 1 ISO implementation data groups' (both ISO, ISO 14000, ISO 9000, all data and no ISO) ratios in European industrial activity classification (NACE) branches



Source: own processing by authors

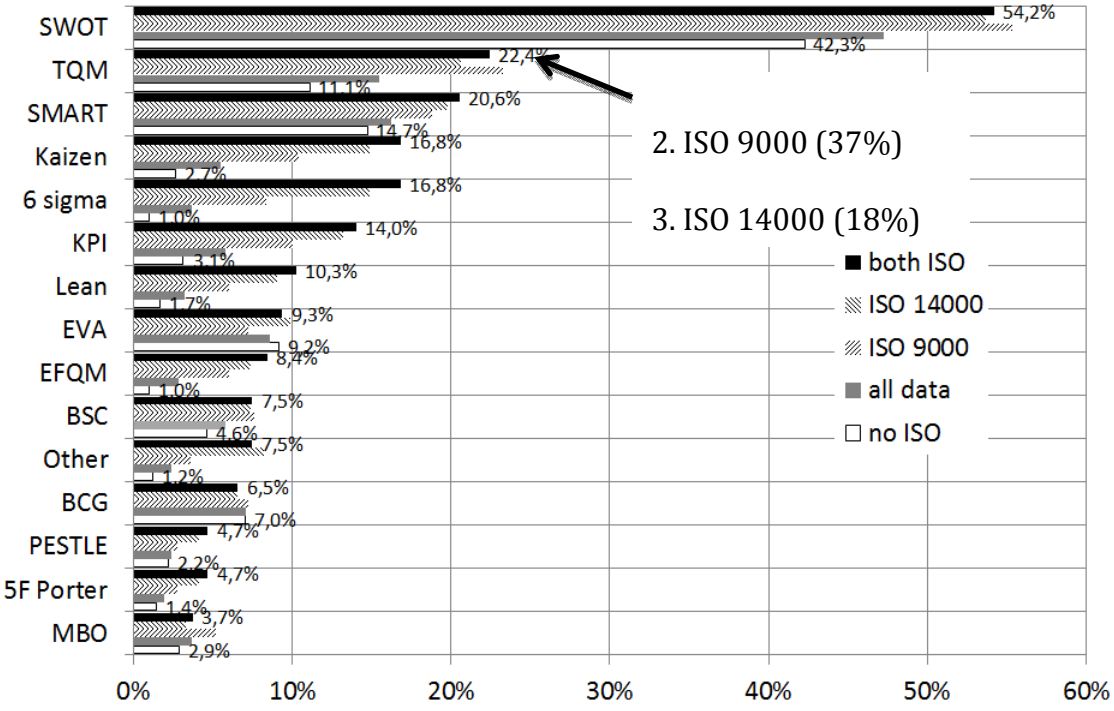
Economic activity statistical evaluation (NACE) on figure 1 shows, that most researched companies (24 %) of all data group is active in section C – Manufacturing. Interesting is comparison of both ISO implemented group – 39 % active in Manufacturing to no ISO data group – only 18 % active in Manufacturing (the difference is 21 % with advantage to both ISO).

Next strong category of all data group (23 %) belong into section G – Wholesale and retail trade; repair of motor vehicles and motorcycles. Again interesting is comparison of both ISO implemented group – only 10 % active in Wholesale and retail trade to no ISO data group – 29 % active in Wholesale and retail trade (the difference is 19 % with advantage to no ISO).

Third strong section is F – Construction: 13 % of all data, but 22 % of both ISO with comparison to only 10 % of no ISO data group (the difference is 12 % with advantage to both ISO). All other sections are each covered fewer than by 10 % of researched enterprises.

Hypothesis H1 is approved: ISO 9000 and ISO 14000 are predominantly implemented in branches of Manufacturing and Construction (61 % of both ISO group in comparison to only 28 % active in Manufacturing and Construction with no ISO implemented.)

Fig. 2 Ratios of management methods utilization according different data groups concerning ISO implementation (both ISO, ISO 14000, ISO 9000, all data and no ISO)



Source: own processing by authors

Tab. 1 Percentage of management methods utilized by specific data group (no ISO, all data, ISO 9000, ISO 14000 and both ISO)

	MBO	5F Porter	PESTLE	BCG	Other	BSC	EFQM	EVA
no ISO	2,9%	1,4%	2,2%	7,0%	1,2%	4,6%	1,0%	9,2%
all data	3,7%	1,9%	2,4%	7,1%	2,4%	5,8%	2,8%	8,6%
ISO 9000	**5,2%**	2,8%	2,8%	**7,2%**	3,6%	**7,6%**	6,0%	7,2%
ISO 14000	3,3%	4,1%	4,1%	6,6%	**8,3%**	7,4%	7,4%	**9,9%**
both ISO	3,7%	**4,7%**	**4,7%**	6,5%	7,5%	7,5%	**8,4%**	9,3%
max. - min.	2,3%	3,2%	2,5%	0,7%	7,1%	3,0%	7,4%	2,7%
ranking								

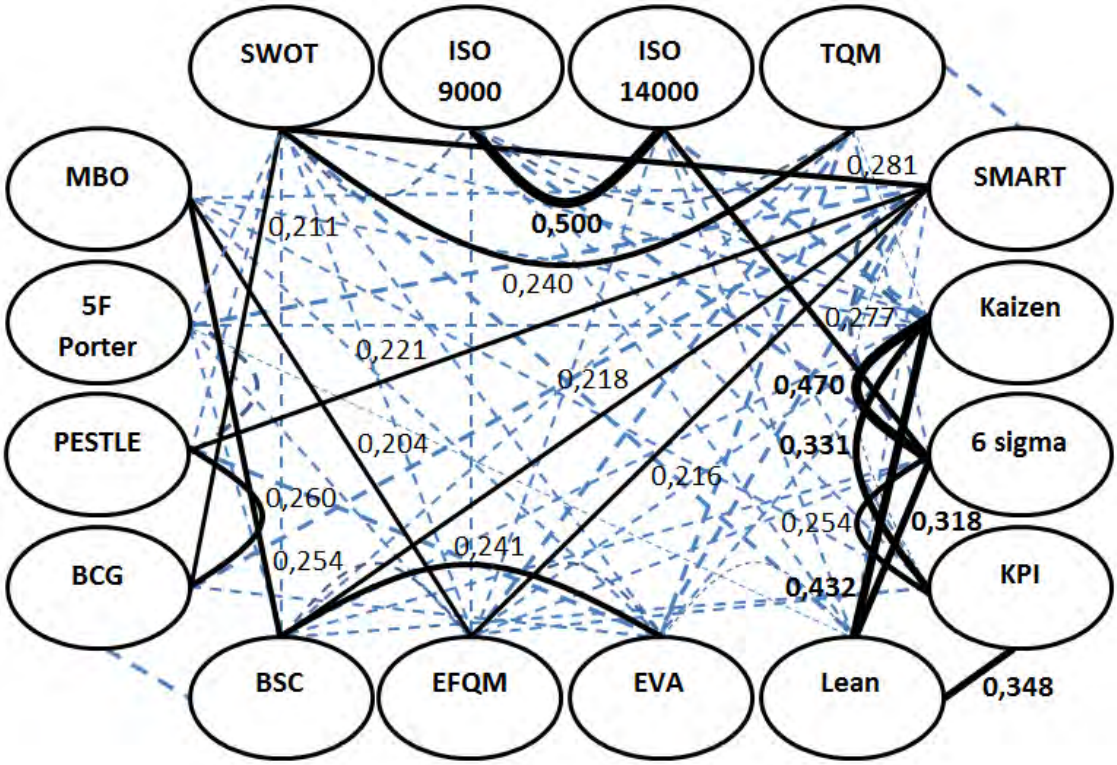
	Lean	KPI	6 sigma	Kaizen	SMART	TQM	SWOT
no ISO	1,7%	3,1%	1,0%	2,7%	14,7%	11,1%	42,3%
all data	3,2%	5,8%	3,7%	5,5%	16,2%	15,5%	47,3%
ISO 9000	6,0%	10,0%	8,4%	10,4%	18,9%	**23,3%**	**55,4%**
ISO 14000	9,1%	13,2%	14,9%	14,9%	19,8%	20,7%	53,7%
both ISO	**10,3%**	**14,0%**	**16,8%**	**16,8%**	**20,6%**	22,4%	54,2%
max. - min.	8,6%	10,9%	15,9%	14,2%	5,8%	12,2%	13,2%
ranking		5.	1.	2.		4.	3.

Source: own processing by authors

Figure 2 clearly shows that generally most well-known and utilized is simple method SWOT (47.3 % of all data group). Second and third most popular are QMS ISO 9000 which use 37 % of all data group and EMS ISO 14000 which use 18 % of all data group (lines not included in figure 2 – detailed analyses were published earlier by Pawliczek [8]). Fourth and fifth position occupies SMART with 16.2 % of all data group and TQM with 15.5 % of all data group. All other methods are less than at 10 % of all researched enterprises (full grey lines). Hypothesis H2 is confirmed: Most (more than 50 %) enterprises do not utilize any modern management method or system. Slight exception is SWOT analysis, which employs approximately half of companies. All other methods are fairly under 40 % and lower.

However there is significant sensitivity to ISO implementation which is well described in table 1. Implementation of either ISO 9000 or both ISO shifts utilization of other management methods to intensely higher level. This phenomenon is most visible at 6-sigma method (shift from 1.0 % to 16.8 % with both ISO), next Kaizen method (shift from 2.7 % to 16.8 % with both ISO), also basic SWOT (shift from 42.3 % to 55.4 % with ISO 9000 alone), TQM (shift from 11.1 % to 23.3 % with ISO 9000 alone) and KPI (shift from 3.1 % to 14.0 % with both ISO). Generally we can say, that no ISO implementation also means lower interest in other management methods with two exceptions: EVA (slightly more employed by companies with ISO 14000 and less by companies with ISO 9000) and BCG (very low sensitivity to ISO).

Fig. 3 Modern management methods' correlation diagram (map) with Pearson coefficients significant at the 0.01 level calculated by SPSS software



Source: own processing by authors

Figure 3 shows very interesting correlation map characterizing inner interconnections in utilization of management methods. Strongest Pearson correlation (0.500) we can see between ISO 9000 and ISO 14000. This phenomenon authors already described in previous works and correlation index confirms it [8], [9]. Furthermore however we can see medium correlated (0.254 – 0.470) "production cluster" of methods plugged into ISO 14000: **6-sigma – Kaizen – Lean – KPI**.

There is noticeable another correlation (0.204 – 0.281) "double-cluster", bigger and looser: **SMART – PESTLE – BCG – SWOT** with associated TQM and **SMART – EFQM – MBO – BSC** with associated EVA. Hypothesis H3 is confirmed: It is possible to notice groups or "clusters" of management methods with mutual correlation, which are implemented jointly. Generally all methods are interconnected at least by small correlations (dashed line is under 2.00 but still significant at the 0.01 level). Highest number of correlation linkages has SMART (13), Kaizen and EFQM (12). Most isolated methods are PESTLE and BCG (5 correlation linkages).

4. Discussion

There was found very limited resources to compare our findings. The most important source [1], [6] deduces with concordance with us, that "active knowledge of modern management methods is on relatively low level. Only 22.55 % of respondents stated any method of management. Most used methods are Lean, 6-sigma and BSC. Most experienced in utilization of modern management methods are companies active in manufacturing (production)"[1]. Other studies evaluates other sets of methods as for example TQM, JIT, core competence, outsourcing, network organizations and benchmarking, so that results are not compatible and comparable [3]. From wider perspective usage of modern management methods creates "competitive intelligence" – disposal of information and knowledge about customer, competition and other aspects of external surrounding, where organization operates for sake of competitive advantage, risk limitation and mapping of potential opportunities [7]. Even in the area of enterprise performance measurement companies use rather simple "comparison of plan and reality" method, than BSC, EFQM or other advanced quality management techniques [11].

Conclusion

Presented paper introduced new findings concerning praxis of enterprises in Czech and Slovak Republic regarding utilization of modern management methods and systems. There was indicated, that employment of management system is generally very small. Enterprises use mostly only basic SWOT analyses. Implementation of ISO 9000 and ISO 14000 management systems also induce increased awareness and usage of other management methods. Moreover there was found out, that management methods are utilized jointly, tend to correlate and create so cold "clusters", for example "production cluster" including ISO 14000 – 6-sigma – Kaizen – Lean – KPI. The clusters can differ under management schools used in companies.

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Innovation Activities at Tourist Information Centers and an Increase in Competitiveness for Tourism Destinations

Abstract

The modern consumer reflects a particular lifestyle that has been adopted by society and part of which is the ever-growing significance of entertainment and leisure time. The most significant trend influencing current demand for services in the tourism industry is the individualization of demand. The consumption of tourism services in contemporary society is considered to be a standard part of consumption in general. Tourists proceed from available information offered by particular destinations and essentially create their own travel and tourism products. Consumer behavior is most often followed according to how they react to what is offered. Tourism industry products and services are always implemented at a particular destination and these services are administered by a range of providers whose share is constantly changing in real terms and over time. Tourists buy these partial products and their consumption provides a feeling of satisfaction, which is further fulfilled by the synergetic effect resulting from their current consumption level. For tourists, distance from their residence complicates their familiarization with the tourism supply of a particular destination. Tourist information centers provide important assistance for their decisions. They are involved in the development of tourism in localities and regions by communicating tourists' requirements to the providers of individual services. They are special-purpose facilities that provide objective and evidence-based information on destinations, tourism services, and the leisure and cultural supply in the area in which they operate. By utilizing the services of the tourist information centers, tourists can receive premiums in the form of discounts, and service providers are encouraged to specialize their offerings. There are currently more than 600 tourist information centers registered in the Czech Republic, which are grouped together voluntarily in the Association of Tourist Information Centers of the Czech Republic.

Key Words

destination management organization, innovation, tourism, tourist information center

JEL Classification: L32, L83

Introduction

When purchasing a composite product offered by a tourism destination, the use of rational consumer choice is more difficult. Composite product belongs to the sphere of personal services, because they contains some elements of intangibility and their production takes place only with the participation of the customer. For tourists, distance from their residence complicates their familiarization with the tourism supply of a particular destination. Tourist

information centers (TIC) provide important assistance for their decisions. The supply of services in a tourism destination is made up of a composite of the activities of companies (network of providers). Their market position depends not only on the quality of services provided, but also the forms and success of their communication with customers. Part of the business process, which is the sum of other related activities that the company must provide to ensure their active work, is not only advertising, but also finding new customers.

Tourist information centers cooperate not only with visitors, to whom they sell or provide services free of charge, but of course with the providers of those services, whether in the public or private sector. An integral part is also working with local residents. They themselves and their local products are part of the destination and make up the supply, and at the same time, they are also visitors to events arranged by the TIC. In the process of strengthening their competitiveness in the market, tourist information centers should behave as companies. In the context of the Czech Republic however, most TICs have been established by local or regional authorities. This often means that their behavior is not dependent on the market and there is a weak focus on increasing competitiveness.

The transformation of a TIC, whose original purpose is to promote a destination, into a business entity that creates new utility value by changing its strategy, can occur through innovation. This means expanding the role of TIC destination management towards tourists (customers of the destination). This, at the same time, increases the activity of entrepreneurs in accommodation, catering, transport and attractions that continuously inform the TIC on vacancies, prices, supply, etc. This is a specific business strategy that creates new value for money for customers. Tourists can obtain premiums (discounts) for using the TIC and service providers are motivated to specialize their offerings. The resulting effect, which increases the benefits for all involved, is that the length of stay of tourists in the area is extended.

1. Theoretical aspects of the individualization of demand in tourism

In today's world, lifestyle ceases to be based on the free decisions of man, but more related to the presentation of his identity. Individualism, which is a manifestation of human emancipation and self-awareness, "...is actually the only thing that remains to a person in this atomised society" [13, p. 105]. This model of individualization affects all dimensions of human life and increases their dependence on the market. Although people are casting off many traditional life relationships, their consumption is leading to the standardization and unification of existential forms. The hallmark of our society is becoming "...mass consumption of housing, household appliances, and articles of daily use designed for the masses, as well as of opinions, habits, attitudes and lifestyles disseminated by the media" [3].

At the end of the nineteen seventies consumer society passed its second phase, i.e. a society of abundance, in which the consumption of goods was raised to a style of life and to a meaning of life. Emotional consumerism – or consumption for the emotional effect, understood as amassing pleasure, gratification and subjective well-being, became a new

incentive. Consuming today serves not only as a presentation of an individual's social and economic identity, but it also gives one the chance to answer the age-old question – "who am I?" "Homo consumericus" buys standard products; however, these are always being interpreted in new ways and arranged in different patterns of consumption which express his individual identity. "Consumption depends more and more on individual goals, hobbies and criteria" [12, p. 46].

The birth of an individual consumer is a result of a range of factors. The most important ones are goods diffusion (e.g., broadening of the supply of durables – cars, electric appliances), the entertainment industry boom, transformation of distribution networks, services growth, and above all, an increase in income. "For the typical consumer there is a predominance of non-real services over real ones. Real ones have an authentic quality (they are not artificial products of the advertising and fashion industries). They contribute to the emancipation of the person. However, a consumer also affirms, for many reasons, his need for the opposite – non-real needs, which are generated by the market or competition between companies" [5, p. 186]. Individual hedonism is supported by self-service sales (direct contact between the supply and demand) and the growth of leisure time, which has led to a higher expenditure on entertainment and leisure time activities. One expression of the individualistic consumer is impulse purchasing, which brings immediate joy and happiness, here and now. A consumer becomes more emancipated, and at the same time, is creating his own lifestyle. He comes across only one barrier – his purchasing power. A man changes into "an entrepreneuring consumer" and becomes a consumer specialist. "Consumption attitudes lead a person to an idea – that it is his duty to make himself and his life better, to cultivate and develop himself, and to overcome his own personal deficiencies, as well as other obstacles blocking the path to his style of life" [11, p. 133].

Nowadays, one does not buy a product, but a lifestyle connected to a particular brand. "The most important thing is no longer the social effect and the moment of 'have you seen what I've got?', but rather the image of the brand" [12, p. 53]. We do not want to impress other people, but ourselves. The goal of the individual person is to build his own lifestyle and fill his leisure time. Economic wealth helps us to reach a broader individual sovereignty; however, it causes our deeper dependence on market power. The source of unlimited consumer demand is not a competitive struggle for higher social status, but a person focused on himself and endowed with the freedom to reshape and manage his own life.

The modern consumer reflects a particular lifestyle that has been adopted by society and part of which is the ever-growing significance of entertainment and leisure time. It is estimated that people over 15 years old spend about 30 percent of their time on entertainment and social activities. The "leisure time industry" has focused on participative and emotive activities, and offers more and more experiences within the framework of entertainment and spectacles, games, tourism, and sports. Each of them has its own economic character and social address and is intended for a particular lifestyle. A consumer becomes a "collector of experiences" and consuming, like a game, becomes its own particular reward. The most significant trend influencing current demand for services in the tourism industry is the individualization of demand – 66 per cent of Czechs organize their holidays on their own, and 34 per cent use travel agency services (which is the highest percentage within the EU).

Demand in tourism results from the decisions of individuals who visit a particular destination to meets their needs. The consumption of tourism services in contemporary society is considered to be a standard part of consumption in general. Tourism is only in small part a component of the existential function of consumption, while its imaginative and symbolic significance is much more important for man. For many people, a visit to a particular destination represents "conspicuous consumption" and so people create "their own identity", possibly confirming affiliation to a specific layer (group) of society.

Tourists proceed from available information offered by particular destinations and essentially create their own travel and tourism products. Consumer behavior is most often followed according to how they react to what is offered. Consumer motivation in travel and tourism varies from the satisfaction of other demands, because it lies at the very top of the needs hierarchy (Maslow). Tourism is a product intended for leisure time; it meets one's need for self-realization and strengthens one's sense of fulfillment. It is an expression of the individualism of one's life path. These expressions bring about socio-cultural changes in the current society which are the result of a "…mutual strengthening of always separately progressing development dynamics…" [7, p. 193].

A tourism industry product from the supply side is "…a flexible set of individual, different, and relatively independent activities implemented through various services and types of goods that create a unique and variable package of individual and differentiated services" [2, p. 155]. Tourism industry products and services are always implemented at a particular destination and these services are administered by a range of providers whose share is constantly changing (in real terms and over time). From an economic point of view, tourism industry products are offered in only portions of markets and are "produced" by providers of "partial products" – transport, accommodation, catering, entertainment and attractions (natural, historical, cultural, sport, souvenir, local crafts) [15, p. 136 – 137]. Tourists buy these partial products and their consumption provides a feeling of satisfaction, which is further fulfilled by the synergetic effect resulting from their current consumption level.

According to neoclassical theory, the optimal combination of goods has been purchased by a consumer if, within his budgetary constraints and given the prices, he can not further increase the overall benefit. A condition for consumer equilibrium is an equal balance of marginal utilities of all goods consumed in relation to their prices. The practical application of this conclusion is difficult because with most purchases consumers are not able to check all prices and specifications of the currently available products.

2. Tourist information centers as a component of destination management

Mapping out the situation in the area of tourist information centers in the Czech Republic took place over half a year within the project Measuring of tourism effects in comunity of Lipno nad Vltavou. The aim of the study and research project was to find out which organizations were involved in the management of destinations and information management, who initiated their formation, the extent to which the public administration and business sector participates in the management of destinations, including financial

support, who the members are, etc. The main sources for the investigation were gathered from publicly available information from tourist information centers' websites, annual reports from institutions and organizations, and the knowledge and experience of the authors. This was followed by an analysis of secondary data and the creation of a basic information management model showing the relationships of all stakeholders (elements) – management relationships, collaboration, financial support and how the stakeholders share in the information management.

For some tourists, completion of these partial products is done by travel agencies. Most tourists, however, complete their "product" on their own and only utilize available offers. Providers of partial products do not know their prospective customers´ needs and wishes, or their financial possibilities, etc. Therefore, the structure of the tourism industry products on offer does not fully correspond with the demand structure. Quite a substantial segment is not used, especially in the area of domestic tourism (occupancy rate in the Czech Republic is on average approx. 35 percent).

Tourism in the Czech Republic is currently determined by the supply, because the foundation of its development is the destination product offered. The consumer is "acquired" on the basis of a presentation of the attractions in a given destination. Tourism information centers, which are special-purpose facilities that provide objective and evidence-based information on destinations, tourism services, and the leisure and cultural supply in the area in which they operate, play a significant role in the presentation of destinations. In the Czech Republic, this is dominated by the promotion of attractions and partially the marketing of destinations. Many of them also, in carrying out their business activities, offer and sell paid services related to tourism, such as guided tours, ticket bookings, etc.

For TICs, business is no longer just about the most typical activities, such as the provision of information and selling of souvenirs, but with growing competition on the supply side and the growing individualization of demand, they must also find and address prospective visitors, offer them services leading to the fulfillment of their primary, as well as additional, tourism needs at the site, and ensure their satisfaction so they return again. A study carried out for CzechTourism, "The Organization of Tourism in Administrative and Tourist Regions of the Czech Republic" [14], shows another status of tourist information centers in relation to destination management at the regional and local level. TICs at the local level are far more active and very often assume the role of destination management organizations (DMO). These primarily includes areas where there is an absence of a strong regional DMO. Within the framework of regional destination management, tourist information centers supply typical services, meaning providing information to visitors and more or less cooperating with the regional destination management. TICs, which play the role of local DMO, are mostly private entities, such as Ltd. or non-profit public companies. Their market behavior, including increasing competitiveness, forms their main goal and their strategies corresponds to this.

A system-based approach to tourism, resulting from a general understanding of the destination product, regards a TIC as one of the actors in the "production" of this product. The interaction of all actors involved in tourism services at the destination is initiated and

coordinated by destination management organizations. The experience of countries with already developed tourism shows that a significant factor in the expansion of local and regional tourism is institutional support implemented through regional development agencies, such as the regional secretariats in Switzerland.

In the Czech Republic, the founders of these organizations vary, usually only perform marketing functions, and in most cases are not standard destination management organizations. The result of this approach is the fact that in the Czech Republic it has long been difficult to secure functional cooperation between the business and the public sectors in the preparation and production of tourism products. A DMO should play the role of "facilitator", which first stimulates the so-called crystallization of the core, and gradually helps in creating a functional unit, whose output is the destination product. The integrating principle of this process is a public-private partnership (PPP), which helps bridge the fragmented interests of individual entities in the form of creative connections. The principle of partnership is an inevitable element of the development of sites and regions, because it generates a collective learning process, and the dissemination of positive experiences from practice enhances economic growth and competitiveness.

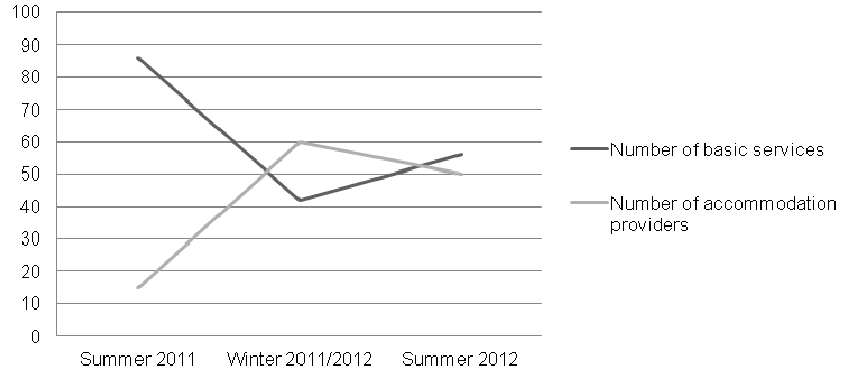
TICs are involved in the development of tourism in localities and regions by communicating the requirements of tourists to the providers of services. Stimulation of innovation activities at TICs comes not only from the demand side (from tourists), but also from the supply side, i.e. service providers. This is confirmed by empirical experience that "...most innovation does not have its origins in basic research, but reflects the market situation" [8:26]. In the context of TICs, innovation is the creation, dissemination and use of information (knowledge). This innovative process is market-oriented and aims to ensure that the TIC acquires new skills and provides customers with greater value. TICs thus use their hidden competitive advantage, which lies in the information (data) in their possession. Correctly interpreting and quickly using this data adds value, not only in the satisfaction of tourists, but also in cost savings and increased turnover for the producers of tourism services.

3. The business strategy of tourist information centers

The "bottom-up" approach is highly characteristic of the business and non-profit sectors in the establishment of DMOs. Such an approach is often applied in Switzerland for example, where service providers in tourism initiate the formation of a DMO, when immediate profit, arising from the synergistic effect of co-ordination and co-operation activities is their immediate motive, as well as the development of the destination in which they operate, which will provide them income in the future. In the Czech Republic there is no example of a destination at the tourism-regional level, which has strictly applied this approach. The bottom-up approach occurs at the level of management of tourist areas and local destinations. An example in the Czech Republic may be the destination management organization Lipensko Ltd., which was founded on 4 April 2011 to promote the development of tourism in the Lipensko area. The advantages of this approach lie in establishing cooperation from entrepreneurs and service providers, and then inviting representatives of the public sphere. The private sector itself voluntarily participates in the development of tourism in the area and follows motives other than "only" short-term gain.

The disadvantage may be low support from the public sphere if there is no agreement on common objectives in terms of territorial development.

Fig. 1 Number of basic services and accommodation providers involved in Lipno Card



Source: Own elaboration with data from Lipno Infocenter [10].

The following data and information were derived from the project "Measuring the Effects of Tourism in the Municipality Lipno nad Vltavou" [10]. An example of a TIC executing the tasks of a local DMO is the Lipno Infocenter in Lipno nad Vltavou. The information center is open year round, takes on the role of destination management through Lipensko Ltd., and its newest product is called the Lipno Card. The guest card project, Lipno Card, was initiated in order to increase the attractiveness of destinations in the surroundings of Lake Lipno. The main motive of the project was to develop and offer a comprehensive collection of attractive services for the summer season in 2011, in close collaboration with key stakeholders and infrastructure across destinations, with the additional bonus of "expediency" and the aspect of added value for the client. The guest card is a marketing tool making used of various benefits and discounts at participating client service providers (Figure 1). In the summer of 2011, a total 90 services were involved in the project with discounts (hypothetically) exceeding CZK 5,000. There was no fee required for service providers who participated in the first wave of the project. Gradually, an amount ranging from 2,500 to 20,000 CZK was collected according to the nature of the service and the competitive potential.

Regarding the demand, accommodation bookings and real demand for accommodation, thus the supply addressed by the Infocenter and its subsequent use, this was highest in February (winter season) and July (summer season). This is the main season, so we can assume a high percentage of occupancy in accommodation facilities, which relates to the increased reluctance of tourists to invest more time and energy to this act. Even so, the use of the offers year-to-year (2010/2011) decreased by 34 %. After receiving the offer, people apparently directly addressed the specific accommodation providers themselves and bypassed the TIC. This meant an unpaid service from the TIC. The lowest utilization rate for the offer was in October. The Infocenter had its highest sales from the sale of goods and services falling within the 20 % VAT rate. Sales in this category made up 53 % of total sales in 2012, followed by the sale of maps, stamps and postcards.

The transformation of a TIC, whose original purpose is to promote a destination, into a business entity that creates new utility value by changing its strategy, can occur through

innovation. According to Drucker, "...from the physical point of view there is no change, but from an economic point of view there is something different and new" [4, p. 241]. Fundamentally, this means a search for new answers to the question: What do tourists need, so that TICs can really serve them? The answer comes from the analysis of the utility of services that a TIC provides to tourists, i.e. of the satisfaction which it brings to them.

This is about expanding the role of TIC in destination management towards tourists (customers of the destination). In parallel, the activity of entrepreneurs is increased in accommodation, catering, transport and attractions, which continuously informs the TIC on vacancies, prices, the supply etc. On the basis of this information, a TIC generates a "catalog of destination services" and is able (for a fee) to make bookings for tourists, offer special programs, solve their acute problems, etc. It is a specific business strategy that creates new value for money for customers. "Creating utility value allows people to satisfy their desires and their needs in their own way" [4, p. 243]. This is what TICs can do for their customers, and which is the ultimate goal of any business. Tourists can obtain premiums (discounts) for using the TIC and service providers are motivated to specialize in their offerings. The resulting effect, which increases the benefit for all involved, is an extended stay in the area by tourists.

4. Categorization of the tourist information centers

There are more than 600 tourist information centers registered in the Czech Republic, which on a voluntary basis, are grouped together in the Association of Tourist Information Centers (ATIC). "The legal form of a TIC corresponds to the status of the founder. The most common founders are public bodies (municipality, city, administrative region, state) and organizations established by them, as well as enterprises of the administrative regions or state and voluntary associations of municipalities. All appropriate legal forms for information centers are listed in the Methodology of Information Centers on the A.T.I.C. webpages" [1].

Currently, the process is underway for a single TIC certification system under the auspices of the Ministry of Regional Development of the Czech Republic as part of the framework for the Czech System of Quality Services in the Czech Republic. According to the new certification system, the basic tourist information center activities as set as follows:

- A TIC searches for, collects, updates and disseminates accurate tourist information from the area within its scope (municipality, city, region, country).
- A TIC provides the public with information from the database by all available means (orally, by telephone, in writing, through electronic media, etc.) while accepting the principles of sustainable tourism. Oral information is provided free of charge to visitors. Other services may be appropriately charged for. For this purpose, a list of services with a price list is located in the TIC in a conspicuous place for review.
- Providing free information is the predominant activity of the TIC. If a TIC offers and sells additional services and products related to tourism (e.g. if it also functions as a travel agency), it does so only on condition that it does not interfere with the

comprehensiveness and objectivity of the information and while maintaining the quality of service of a TIC.
- TIC staff have access to the document "Quality parameters of services to clients and visitors to tourist information centers" in the latest updated version.

The list of these basic activities implies continuance of the ingrained function of the TIC without any greater degree of innovation. And this is also proven by the categorization (Tab. 1).

Tab. 1 Categorization of the TIC in the Czech Republic

Category	Characteristic
A	State-wide information centers are marked with four stars.
B	Area-wide information centers are marked with three stars.
C	Local year-round information centers are marked with two stars.
D	Seasonal information centers are marked with one star.

Source: Own elaboration with data from the Ministry of Regional Development CZ [9].

Conclusion

Because the categorization based mainly on quantitative indicators such as the number of opening days, and the world languages in which information is given, it may be that the a local TIC in category C with two stars will be a first-class functional destination management organization, which operates in the market based on a business strategy. However, it will be rated with two stars. The rating reflects more the level and the geographical scope than the quality and range of services.

The innovation process should reflect the increasing need for obtaining and providing information on tourism, not only for visitors to the destination, but also for public authorities, businesses and other entities. Tourist information centres are part of an information system which "...consists of people, equipment and procedures to collect, sort, analyze, evaluate and distribute needed, timely and accurate information for decision-making in tourism" [6, p. 111].

TICs are involved in the development of tourism in localities and regions by communicating the requirements of tourists to the providers of services. Stimulation of innovation activities at TICs comes not only from the demand side (from tourists), but also from the supply side, i.e. service providers. In the context of TICs, innovation is the creation, dissemination and use of information (knowledge). This innovative process is market-oriented and aims to ensure that the TIC acquires new skills and provide customers with greater value. TICs thus use their hidden competitive advantage, which lies in the information (data) in their possession. Correctly interpreting and quickly using this data adds value, not only in the satisfaction of tourists, but also in cost savings and increased turnover for the producers of tourism services.

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Usage of AHP and Topsis Method for Regional Disparities Evaluation in Visegrad Countries

Abstract

The socio-economic disparities in the level of the regional performance are a major obstacle to the balanced and harmonious development of the regions, but also of the territory as a whole. At supranational level, it is European Union (EU) that supports the elimination of differences between less and most developed Member States and regions to strengthen the cohesion and competitiveness of European territory. The effort to reduce the economic, social and territorial disparities has especially increased since the EU biggest enlargement. The accession of new Member States has been associated with an increase in regional disparities that have negatively affected the EU competitiveness in global scale. The strengthening of competitiveness and convergence of economic performance with an average level of the EU have become the basic objectives for new Member States. The Czech Republic, Hungary, Poland and Slovakia, called Visegrad Four countries (V4), belong to new Member States whose economic development of the last 10 years has been strongly influenced by EU accession. Although the regional disparities have been reduced in V4 with contribution of EU Cohesion policy, negative disparities have still persisted. This paper is aimed to evaluate the regional disparities of socio-economic development in V4 in the period 2000-2010 using analytic hierarchic process (AHP) and TOPSIS method. Theoretical background of the paper outlines the concept of regional disparities in the EU and focuses on AHP and TOPSIS methodology. TOPSIS is one of the multicriteria decision-making methods that can present an alternative way of regional disparities and its evaluation. The empirical part of the paper deals with multi-criteria evaluation and comparison of differences between NUTS 2 regions in V4 based on selected economic, social and territorial indicators. At first, the weights of indicators for disparities evaluation are computed based on method of pairwise comparison in the context of AHP. Through TOPSIS method the ranking of regions is determined in year 2000, 2005 and 2010.

Key Words

AHP, multicriteria decision-making method, pairwise comparison, regional disparity, TOPSIS, Visegrad Four

JEL Classification: C49, R11, Y10

Introduction

The measurement of socio-economic disparities between regions is the main topic of many regional economic researches. Disparities negatively affect the internal coherent and balanced development of the EU as well as the level of global EU performance and competitiveness, which is highly related to the imbalanced development in economic, social and territorial cohesion [6]. On one hand the quality analysis of disparities brings

important information about the key issues in the region, on the other hand it is also dealing with development potential. Nevertheless, regional disparities evaluation is impaired by a lack of integrated approaches and methodologies in the EU [9].

The aim of the paper is to evaluate the regional disparities of socio-economic development in Visegrad Four (V4) countries in the period 2000 – 2010 using AHP and TOPSIS method**.** The paper should contribute to accept or reject the hypothesis that the main regional disparities exist between NUTS 2[1] regions with capital city (Praha, Bratislavský kraj, Mazowieckie, Közép-Magyarország) and other regions in V4. In the absence of the mainstream to regional disparities evaluation, this paper can be understood as a contribution to discussion about quantitative measurement of disparities between regions.

1. Approaches to regional disparities evaluation in the EU

Within European approach we recognize three types of disparities which characteristic provides following table 1.

Tab. 1 Basic classification of regional disparities in the EU

Type of disparities	**Definition**
Economic disparities	They are related to regional output in wider context of economic performance, structure, development and manpower. Economic disparities are measures of economic cohesion that increases when the weakest regions are able to catch up with advanced ones.
Social disparities	They are related to how people perceive spatially differentiated quality of life, standard of living, social inequality, etc. Social disparities are primarily considered in relation to unemployment.
Territorial disparities	They reflect strong inequalities of economic performance, physical-geographical potential and transport and technical infrastructure, etc. These differences are most important between centres and peripheries.

Source: [5], [7]; own modification

The evaluation of regional disparities is related to the problem of the lack of uniform methods or an aggregate index. The level of regional disparities within EU is evaluated by the Cohesion Reports published by the European Commission every 3 years [1], [2]. Most of the existing approaches to regional disparities evaluation use several indicators that are processed by different mathematical and statistical methods. The aim is usually to obtain one comprehensive index (or more indices in the case of thematic evaluations) that represents each of the territories analysed [9]. Most of the economic inequalities

[1] The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU for the purpose of the collection, development and harmonisation of EU regional statistics. The level NUTS 2 presents basic regions for the application of regional policies.

are measured by a variety of indices based on the indicator of gross domestic product, e.g. coefficient of variation, the Geographic concentration index, the Theil index, see e.g. [13]. A highly innovative approach to disparities analysis in regional development is presented by Viturka [15]. From the point of view of simple calculation, high informative level and applicability of the results in practice, the following mathematical and statistical methods are often used to measure disparities [5]: point method, traffic light method (scaling), method of average (standard) deviation, method of standardized variable and method of distance from the imaginary point. More sophisticated methods that are very useful in the process of regional disparities evaluation are multivariate statistical methods, especially cluster analysis and factor analysis, see [11].

Alternative and not broadly extended approach to regional disparities represents multicriteria decision-making methods, see e.g. [4]. One of the most popular techniques dealing with multi-criteria decision making (MCDM) problems in the real world is the Technique for Order Preferences by Similarity to an Ideal Solution (TOPSIS). It helps decision maker organize the problems to be solved, and carry out analysis, comparisons and rankings of the alternatives. TOPSIS has been successfully applied to the areas of human resources management, transportation, product design, manufacturing, water management, quality control, and location analysis [12]. The high flexibility of this concept is able to accommodate further extension to make better choices in various situations. e.g. in the field of regional analysis. MCDM problems involve criteria of varying importance to decision-makers. Consequently, information about the relative importance (weight) of the criteria is required. A number of criteria weighting procedures have been proposed in the MCDM literature. One of the most popular procedure is the pairwise comparison within analytic hierarchic process (AHP) [8]. In the absence of the mainstream in regional disparities evaluation, used of multicriteria decision-making methods can contribute to discussion about quantitative measurement of disparities.

2. Methodology

Analytic hierarchy process (AHP) and TOPSIS method is applied to the evaluation of disparities between NUTS 2 regions in V4. AHP is used to derive the weights of criteria that are subsequently inserted to weighted decision matrix in TOPSIS method. In using the AHP to model the problem, hierarchy representing the problem is needed, as well as pairwise comparisons to establish relation within the structure [10]. Distances of regions to ideal solution and their final ranking can be obtained from the method TOPSIS.

2.1 Determination of criteria weights by AHP

In this paper, AHP is used to derive the scales from paired comparison in four level hierarchic structures. The decision hierarchy structure is created; the goal of the decision is at the top level, subcriteria (group of criteria) at second level followed by the level of criteria (criteria on which subsequent elements depend). The lowest level

represents a set of alternatives. Having the hierarchic structure, we compare the comparative weight between the attributes of the decision elements in form of pairwise comparison matrices. The comparisons are taken from fundamental scale that reflects the relative strength of preferences. Table 2 exhibits Saaty´s fundamental scale which indicates how many times more important one element is over another element with respect to property to which they are compared to. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.

Tab. 2 Fundamental scale for pairwise comparison

Intensity of importance	Definition
1	equal importance
3	moderate importance
5	strong importance
7	very strong importance
9	extreme importance

Source: [10]; own modification

2.2 TOPSIS method

TOPSIS method is based on the determination of the best alternative that comes from the concept of the compromise solution. The compromise solution can be regarded as choosing the best alternative nearest to the ideal solution (with the shortest Euclidean distance) and farthest from the negative ideal solution [14]. TOPSIS is always used for multi-attribute decision making, by ranking the alternatives according to the closeness between the alternative and the ideal alternative. The main advantage of this approach is that its user could directly input judgment data without any previous mathematical calculations and locate both the ideal solution and the negative ideal solution easily [4].

The procedure of TOPSIS method includes the following steps. The first step is to construct the decision matrix. Given a set of alternatives, $A = \{A_i \mid i = 1,..., n\}$, and a set of criteria (attributes), $C = \{C_j \mid j = 1,..., m\}$, where $Y = \{y_{ij} \mid i = 1,..., n; j = 1,..., m\}$ denotes the set of performance ratings and $w = \{w_j \mid j = 1,..., m\}$ is the set of weights for criteria, the decision matrix can be represented as shown in table 3. Procedure that converts all the criteria so that all of them were either minimization or maximization is often implemented before the execution of TOPSIS method.

Tab. 3 Information table of TOPSIS

	Criteria			
Alternatives	C_1	C_2	....	C_m
A_1	y_{11}	y_{12}	....	y_{1m}
A_2	y_{21}	y_{22}	....	y_{2m}
⋮	⋮	⋮	⋮	⋮
A_n	y_{n1}	y_{n2}	....	y_{mn}
W	w_1	w_2	....	w_m

Source: [14]; own modification

Second step is to calculate the normalized decision matrix according to formula:

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{n} y_{ij}^2}}, \quad (1)$$

where $i = 1,...,n$; $j = 1,...,m$. With regard to the defined weight of criteria, the third step of TOPSIS method is to calculate weighted normalized decision matrix expressed as $v_{ij} = w_j \cdot r_{ij}$, where $i= 1,...,n$; $j = 1,...,m$. The following step includes the determination of the positive ideal solution (H_j) and the negative ideal solution that are derived as H_j = max (v_{ij}) and D_j= min (v_{ij}).

Subsequently, the separation from the ideal (d_i^+) and the negative ideal solutions (d_i^-) between alternatives is calculated. The separation values can be measured using the Euclidean distance, which is given as:

$$d_i^+ = \sqrt{\sum_{j=1}^{k} (v_{ij} - H_j)^2}, \quad (2)$$

$$d_i^- = \sqrt{\sum_{j=1}^{k} (v_{ij} - D_j)^2}. \quad (3)$$

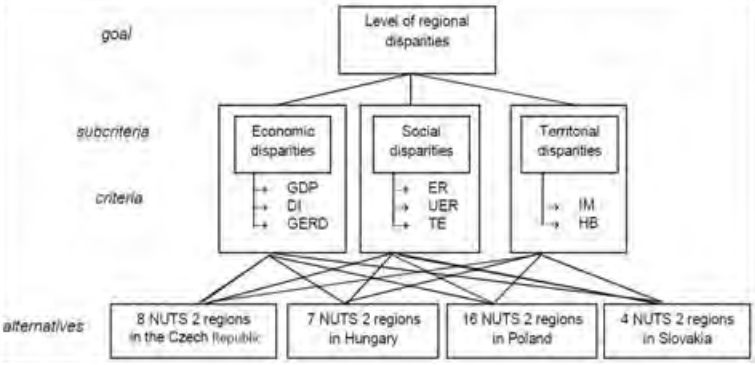
Last step include the calculation of the relative closeness to the ideal solution and rank the alternatives in descending order. The relative closeness of the i-th alternative A_i is expressed as:

$$c_i = \frac{d_i^-}{d_i^- + d_i^+}. \quad (4)$$

3. Application of AHP and TOPSIS method for V4 regional disparities evaluation

In this case, the goal is to assess the level of regional disparities in Visegrad Four countries. As shown in figure 1, the alternatives are 35 NUTS 2 regions (8 Czech NUTS 2 regions, 7 Hungarian NUTS 2 regions, 16 Polish NUTS 2 regions, 4 Slovak NUTS regions).

Fig. 1 Hierarchic structure of evaluation system



Source: own elaboration

These alternatives are evaluated by three types of subcriteria (economic, social and territorial disparities) and eight criteria shown in table 4. These indicators are most frequently used indicators of regional disparities monitored within Cohesion reports (see European Commission, 2007, 2010) and available in Eurostat database.

Tab. 4 Selected criteria (indicators) for disparities evaluation in V4 regions

Criteria	**Abbreviation**
GDP per capita (PPS)	**GDP**
Disposable income of households (PPS)	**DI**
Gross domestic expenditure on R&D (GERD) (% of GDP)	**GERD**
Employment rate (%)	**ER**
Unemployment rate (%)	**UER**
Persons aged 30-34 with tertiary education attainment (%)	**TE**
Infant mortality rate (%)	**IM**
Hospital beds (Number/100 000 inhabitants)	**HB**

Source: [1], [2], [3]; own modification

To determine the final weights of criteria, pairwise comparison in the context of AHP is applied to calculate weights of subcriteria with respect to the goal. After that criteria are pairwise compared against the subcriteria importance. The pairwise comparison matrices are shown in Annex, table 1 – 4. According to final calculated weights of criteria shown in table 5, indicators GDP per capita, disposable income and unemployment rate have the highest importance in evaluation of regional disparities and the level of region´s development.

Tab. 5 Weights of criteria

Subcriteria	Weight	Criteria	Weight	Final weight of criteria
Ecomic disparities	0.7306	GDP	0.6370	0.4654
		DI	0.2583	0.1887
		GERD	0.1047	0.0765
Social disparities	0.1884	ER	0.2790	0.0526
		UER	0.6491	0.1223
		TE	0.0719	0.0136
Territorial disparities	0.0810	IM	0.7500	0.0607
		HB	0.2500	0.0202

Source: own elaboration

According to TOPSIS method described above, combing with determined weight of criteria, the TOPSIS method is applied to evaluate and compare the regional disparities in economic, social and territorial development of 35 regions in V4 in the year 2000, 2005 and 2010.Table 6 shows and compares the scores of relative closeness to ideal solution (ci) and the ranks of regions of those three year, which could reveal the trends of regional disparities. On the basis of wide range value of relative closeness that regions achieved (interval between 0.9 – 0.05), the significant socioeconomic differences between region can be identified. The shortest relative closeness to ideal solution is achieved by regions with capital city – Praha, Bratislavský kraj, Közép-Magyarország and Mazowieckie. These regions are ranked on the top four positions and their ranking has not changed for whole reference period. For the rest of regions the greater or lesser

changes in disparities trends are observed during the examined period. The strong positive trend in reducing disparities is recorded by Czech region Moravskoslezsko, Jihovýchod and Polish region Lubuskie and Dolnośląskie when they have achieved better ranking each year. On the contrary two Czech regions Severozápad, Střední Morava and two Hungarian regions Nyugat-Dunántúl, Dél-Alföld recorded visible weakening of development and increase in disparities since their ranking is getting worse in each examined year. The situation and the ranking of other regions were only slightly changed both in positive or negative sense. For example 13 Polish regions, 4 Hungarian regions and 2 Slovak regions have largest distance (disparity) to ideal situation and they are mostly ordered in the second half of overall ranking. Moreover, in comparison with the year 2000 their positions were not positively, significantly changed in the year 2005 and 2010 which indicates the persistence of regional disparities. In positive sense, regions as Střední Čechy, Jihozápad, Severovýchod,Közép-Dunántúl, Małopolskie, Wielkopolskie and Západné Slovensko kept their position in top twenty for most of evaluated period.

Tab. 6 Comparison of region´s ranking by TOPSIS (2000, 2005, 2010)

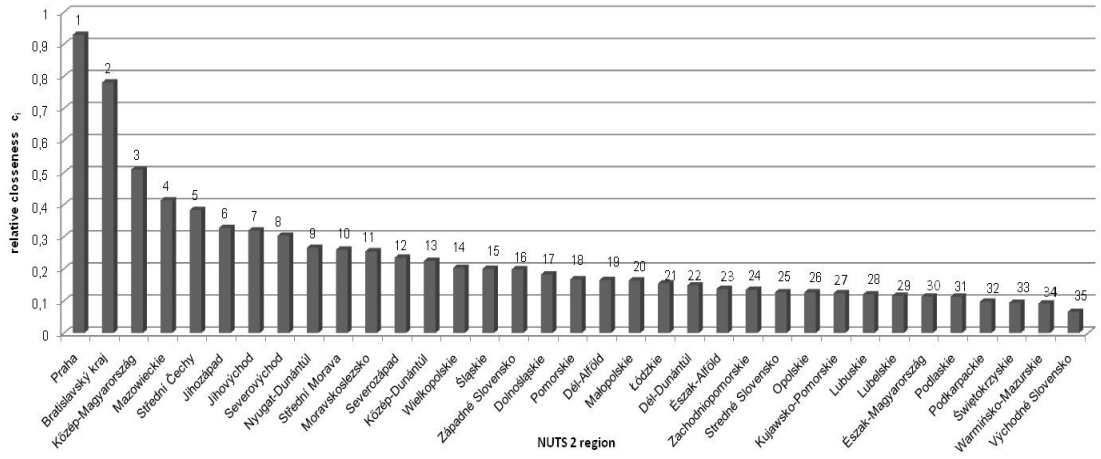
Code	Year	2000		2005		2010	
	Region	c_i	Rank	c_i	Rank	c_i	Rank
CZ01	Praha	0.8928	1	0.9496	1	0.9455	1
CZ02	Střední Čechy	0.4285	4	0.3877	4	0.3334	5
CZ03	Jihozápad	0.3520	6	0.3456	6	0.2847	7
CZ04	Severozápad	0.2652	11	0.2404	13	0.1974	16
CZ05	Severovýchod	0.3401	7	0.3101	8	0.2595	8
CZ06	Jihovýchod	0.3384	8	0.3238	7	0.2961	6
CZ07	Střední Morava	0.2789	10	0.2662	11	0.2334	12
CZ08	Moravskoslezsko	0.2494	13	0.2721	9	0.2412	9
HU10	Közép-Magyarország	0.4894	3	0.5400	3	0.4986	3
HU21	Közép-Dunántúl	0.2498	12	0.2502	12	0.1732	20
HU22	Nyugat-Dunántúl	0.3072	9	0.2674	10	0.2219	15
HU23	Dél-Dunántúl	0.1740	17	0.1698	16	0.1008	32
HU31	Észak-Magyarország	0.1427	25	0.1390	23	0.0578	35
HU32	Észak-Alföld	0.1494	23	0.1600	19	0.1029	31
HU33	Dél-Alföld	0.1974	15	0.1683	18	0.1293	27
PL11	Łódzkie	0.1471	24	0.1288	24	0.1865	18
PL12	Mazowieckie	0.4090	5	0.3624	5	0.4686	4
PL21	Małopolskie	0.1727	18	0.1412	21	0.1764	19
PL22	Śląskie	0.1912	16	0.1690	17	0.2391	11
PL31	Lubelskie	0.1218	28	0.1014	30	0.1241	28
PL32	Podkarpackie	0.1154	30	0.0776	32	0.0993	33
PL33	Świętokrzyskie	0.0972	33	0.0738	33	0.1107	30
PL34	Podlaskie	0.1081	32	0.1076	26	0.1228	29
PL41	Wielkopolskie	0.2071	14	0.1739	15	0.2279	13
PL42	Zachodniopomorskie	0.1557	22	0.1048	28	0.1424	25
PL43	Lubuskie	0.1093	31	0.1058	27	0.1449	23
PL51	Dolnośląskie	0.1628	21	0.1441	20	0.2396	10
PL52	Opolskie	0.1332	26	0.1037	29	0.1424	24
PL61	Kujawsko-Pomorskie	0.1296	27	0.0967	31	0.1455	22
PL62	Warmińsko-Mazurskie	0.0781	34	0.0662	34	0.1305	26
PL63	Pomorskie	0.1656	20	0.1392	22	0.1969	17
SK01	Bratislavský kraj	0.6881	2	0.7915	2	0.8613	2
SK02	Západné Slovensko	0.1664	19	0.2049	14	0.2233	14
SK03	Stredné Slovensko	0.1164	29	0.1112	25	0.1522	21
SK04	Východné Slovensko	0.0529	35	0.0651	35	0.0785	34

Source: own elaboration, 2013

Figure 2 shows the average region´s ranking according to average relative closeness with respect to ideal solution. According to table 5 and figure 2, we could divide the NUTS 2 regions into four levels. First level includes regions of capital city Praha, Bratislavský kraj, Közép-Magyarország and Mazowieckie that are treated as the developed regions with strong economy. The average relatives closeness is in interval 0.9 – 0.4 and therefore these regions are evaluated as the best. The ranking of these

regions implies the visible differences among regions of capital cities and the rest of V4 regions. The group of regions with average relative closeness between 0.3 – 0.2 and with average ranking from 5th to 14th position can be considered as a second level. There are Czech regions Střední Čechy, Jihozápad, Jihovýchod Severovýchod, Střední Morava, Severozápad, Moravskolezsko, two Hungarian regions Közép-Dunántúl and Nyugat-Dunántúl and Polish region Wielkopolskie. These regions rather converge to ideal point and have development potential. The third level can be defined by the regions from 15th to 31th average ranking and includes Hungarian regions Dél-Alföld, Észak-Magyarország, Észak-Alföld, Dél-Dunántúl, Polish regions Małopolskie, Śląskie, Pomorskie, Dolnośląskie, Łódzkie, Zachodniopomorskie, Kujawsko-Pomorskie, Lubuskie, Lubelskie, Podlaskie, Opolskie and finally Slovak regions Západné Slovensko and Stredné Slovensko. These regions represent the middle situation, regional disparities have rather moderate decrease and their economy is still not strong enough. Polish regions Podkarpackie, Świętokrzyskie, Warmińsko-Mazurskie and Slovak region Východné Slovensko represents last level. These regions can be considered as less developed compared to others, their positions to ideal solution are the farthest and they are ranked in last position.

Fig. 2 Average rank of regions (2000 – 2010)



Source: own elaboration

Conclusion

The evaluation of disparities between NUTS 2 regions in V4 has been presented on the basis of eight selected economic, social and territorial disparities and their importance determined by AHP. The highest impact to the rate of disparities and final ranking of regions has economic and social indicators GDP per capita, disposable income and unemployment rate. Applying the TOPSIS method we get the final ranking of regions according to region´s distances (disparity) to ideal solution. Comparison of the region´s ranking indicates the trends of regional disparities in year 2000, 2005 and 2010. It is necessary to take into account that each technique is specific and the results can be influenced by the characteristic of the data file, by the selected number and type of the indicators, as well as by selected method. Presented multicriteria decision making

methods can be considered as suitable and interesting alternative for quantitative regional disparities evaluation.

With regard to the shortest relative closeness to ideal solution, the most developed regions with capital city – Praha, Bratislavský kraj, Közép-Magyarország and Mazowieckie are ranked on the first four positions. These regions didn´t indicate any changes in ranking during evaluated period. On the contrary Polish regions Podkarpackie, Świętokrzyskie, Warmińsko-Mazurskie and Slovak region Východné Slovensko recorded the farthest distance to ideal solution and they are average ranked in last position. These regions did not indicate any significant positive changes in ranking during evaluated period and therefore can be considered as less developed compared to others. For the rest of regions we can observe visible positive, negative or small changes in development of regional disparities during the examined period. Reducing of disparities is recorded by Czech region Moravskoslezsko, Jihovýchod and Polish region Lubuskie, Dolnośląskie. The increasing of disparities can be seen by Czech regions Severozápad, Střední Morava and Hungarian regions Nyugat-Dunántúl, Dél-Alföld. Regions Střední Čechy, Jihozápad, Severovýchod, Közép-Dunántúl, Małopolskie, Wielkopolskie and Západné Slovensko oscillate around similar ranking during whole evaluated period. The final region´s ranking also indicates the substantial differences between Czech regions and other regions. All Czech regions are ranked among the top twenty regions for all three years and region Praha is ranked on the first place among all regions as well as among regions with capital city.

The results partially confirm the hypothesis; main regional disparities in V4 have persisted between regions with capital cities and other regions since year 2000. The dominance of capital cities results from more intensive integration into the world economy, which is reflected in different structures in comparison with other regions. Capital cities are main administrative centres, where the great mass of public institutions and the private sector is concentrated (corporate headquarters, central administrative authorities, universities, etc.). On the other hand, it is necessary to take into account the statistical effect that can overvalue some indicators of economic performance. The approach to regional disparities reduction in V4 should be based on the support of convergence between capital cities and other regions, not from the limitation of capital cities development. Due to diffusion effects, the support of economically successful capital cities and their competitiveness results later in higher performance of whole state, including the lagging regions. The main source for growth of less developed regions is considered an effective use of strengths and opportunities, stimulation of the endogenous potential (particularly innovation potential) and effective using of subsidies from European funds. The specific measures of NUTS 2 regions determined at the second and third level should focus on the use of development opportunities (especially human resources) in combination with continuous activation of strengths and elimination of the weaknesses of each region. The border regions (regions Severovýchod, Severozápad, Nyugat-Dunántúl Dolnośląskie, Zachodniopomorskie, Lubuskie, Západné Slovensko) should boost the cross-border cooperation with more developed regions in Germany and Austria that are to certain extent the impulse for further development of less developed regions. The group of least developed regions defined at fourth level (e.g. Podkarpackie, Świętokrzyskie, Warmińsko-Mazurskie, Východné Slovensko) should focus on higher expenditure on

research and development which are major drivers of economic growth and it also supports future competitiveness that results in higher GDP. The public investments in infrastructure (transport, communication, energy), spending on education and active labour market play the key roles for development of these regions. An important measure is to increase integration of these regions into the European and world economy. The main benefit of integration is the increase in demand for goods and services produced in each region. On the contrary, the public interventions in regions of capital cities are primarily needed for the elimination of the negative environmental and social impacts generated by the strong economic development of the life quality.

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Annex

Tab. 1 Pairwise comparison matrix of subcriteria with respect to the goal

	Economic disparities	Social disparities	Territorial disparities
Economic disparities	1	5	7
Social disparities	1/5	1	3
Territorial disparities	1/7	1/3	1

Source: own elaboration

Tab. 2 Pairwise comparison matrix for criteria with respect to economic disparities

	GDP	DI	GERD
GDP	1	3	5
DI	1/3	1	3
GERD	1/5	1/3	1

Source: own elaboration

Tab. 3 Pairwise comparison matrix for criteria with respect to social disparities

	ER	UER	TE
ER	1	1/3	5
UER	3	1	7
TE	1/5	1/7	1

Source: own elaboration

Tab. 4 Pairwise comparison matrix for criteria with respect to territorial disparities

	IM	HB
IM	1	3
HB	1/3	1

Source: own elaboration

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Performance of the Socially Responsible Investment During the Global Crisis

Abstract

There has been lately a big discussion about the causes of the current financial crisis. Many authors claim that financial markets and investments desperately need innovations. Socially responsible investment is one of such innovations, which has recently attracted great interest. The basic idea of socially responsible investment – investing only into the companies which fulfill some normative criteria – is actually nothing new, but is has been rapidly growing during the last decade. This paper is concentrated on the performance of such investments. According to the traditional portfolio theory, the SRI should perform worse or at best the same as the conventional indices. Nevertheless, there are also opinions proclaiming the superiority of the SRI. These opinions are based on the idea that the socially responsible behavior is a sign of the well-managed company, which is therefore supposed to keep its performance in the future more likely than the "irresponsible" enterprises. Many researches have been conducted to solve this controversy. First part of this paper therefore contains brief overview of the methodology and results of these studies. These researches are not up to date enough, though. Because of the huge change of economic situation caused by the global crisis, in our opinion it is necessary to make new analysis of the performance of the SRI under the current conditions. In this paper we analyzed the risk-adjusted return of the SRI stock market indices in comparison with the standard ones. Obtained results are consistent with most of the previous studies, i. e. no statistically significant difference between the SRI and conventional investments was found.

Key Words

investment performance, socially responsible investment, SRI, stock market indices

JEL Classification: G11

Introduction

Socially responsible investing (SRI) is a concept, where the investments are not evaluated only by their returns, risk and liquidity, but also by some additional, normative criteria. The roots of this idea lie in the religion – the first modern mutual fund which considered even the non-financial criteria was the Christian Pioneer fund founded in the year 1928 and this fund did not invest into the shares of the so called "sinful" companies [1]. Political reasons for the exclusion of some shares from the investment portfolio appeared in the seventies and the eighties of 20th century. As a response to the Vietnamese war the Pax World Fund was created in 1971 and its managers were banned to invest in the military industry. During the eighties, several

mutual funds (both in Europe and in the US) avoided investing into the South-African assets due to the racist apartheid policy practiced by the government of this country [2].

The modern concept of SRI, which emerged in the nineties of 20th century, is no more as straightforward as the above actions. SRI is currently closely linked to the corporate social responsibility (CSR) concept. Similarly as the CSR with its triple-bottom line structure, SRI is also based on three groups of criteria – environmental (usually abbreviated as E, corresponding with the "Planet" pillar of the triple-bottom line), social (S, connected to the "People" pillar) and governance (G, corresponding mainly with the "Profit" pillar). On the other hand, despite the existence of a generally accepted conclusion (confirmed even by some international authorities, such as the United Nations with their Principles for Responsible Investment initiative – see [3]), that the responsible investing should reflect all three of these criteria, there is no "one and the only correct" form of it. Quite the opposite, there are many views on SRI, each of them emphasizing a specific element of the ESG criteria, depending on the preferences of a particular investor. The two major SRI initiatives, USSIF and EUROSIF, for example, recognize seven such views (also called "SRI strategies") [4].

Investment decision making, based on any of such strategies, has recently become more and more popular. According to the estimations made by the Forum for Sustainable and Responsible Investment, the total volume of assets managed in compliance with SRI principles in the North America, Europe, Asia, Africa and Australia reached at least USD 13.6 trillion as of December 31st 2011, which represented 21.8 % of the total volume of assets managed in the regions [5]. It is therefore obvious that SRI has become one of the leading innovations in the asset management.

As the popularity and importance of SRI have been increasing, a question about its financial performance arose. There have been plenty of studies which investigated whether responsible investments perform better, worse or the same as the conventional ones. Nevertheless, no generally accepted conclusion has been arrived at so far. The aim of this paper is a) to present a brief review of the current state of this ongoing discussion and b) to contribute to it with the results of our own research.

1. Current state of the research of the financial performance of SRI

Purely according to the standard financial theory, the performance of the portfolio consisting only of the "responsible" assets should be worse or, at its best, equal to the portfolio without such limitations. The reason is that the exclusion of the shares of the irresponsible companies means the reduction of the universe of the available combinations of the assets. Logically, it should not be possible to construct a better portfolio of such a restricted set of assets than of the original, more extensive one [6], [7].

On the other hand, the supporters of SRI argue that it could improve the performance of the portfolio in such a way that is not counted on by the standard portfolio theory.

According to their arguments, if the company reflects the concept of the corporate social responsibility, it is a signal of the high quality of its management. Social responsibility should therefore enable the SRI investor to pick out only the stocks of the well-managed enterprises and avoid the shares of the poorly-managed ones. In other words, respecting principles of SRI should guarantee that the firms, which (thanks to some previous successes) perform well at the moment, but whose irresponsible management could cause serious problems in the future, will be excluded from the portfolio. From this point of view SRI is not a restriction which prevents investor from managing his/her portfolio optimally. It is the additional source of information, which gives the responsible investor an advantage against the ordinary ones [7], [8].

As no generally accepted conclusion has been arrived at by means of a theoretical approach so far, the question of the financial performance of the SRI has to be solved through the analysis of empirical data. A number of empirical studies concerning this problem have recently appeared. These research studies usually investigate whether the risk-adjusted-return of some representative of the SRI is higher, lower or the same as in case of some appropriate non-SRI benchmark. As the representatives of the socially responsible investments and their benchmarks, either mutual funds or stock indices are used.

The research of the performance of mutual funds is much more numerous. As reported in several reviews and meta-studies (compare [9], [10], [11]), the obtained results are quite ambiguous and do not lead to any decisive conclusion. Quite the opposite, the number of the research studies, which reported better, worse or the same performance of the SRI funds as in case of their conventional peers is more or less equal.

Nevertheless, judging the financial returns of the socially responsible investments in comparison with the conventional ones on the basis of the performance of the mutual funds faces several serious methodological problems. Firstly, the performance of a mutual fund could be strongly affected by the experience and skills of its manager. The results obtained from the comparison of the normal and SRI funds could therefore suffer from serious distortions caused by the differences in the management of the funds. Of course it is possible to object that the expected value of the quality of the managers should be the same for both groups of funds. This argument is based on the presumption that the managers are indifferent to work either for the SRI or a conventional fund, though, which is rather questionable. According to the [12], the social responsibility of the company enhances its attractiveness for the potential employers. If the same effect functions even in favor of the SRI funds compared to the conventional ones (and there is no reason why it should not), the responsible funds will have advantage in recruitment, which will ultimately result into the discussed distortion.

The other problematic issue, which can lead to the distortion of the research results, is the height of fees. The performance of the mutual fund, cleansed of the amount of money charged by the fund for the purchase and maintenance of its shares, can significantly differ from the returns calculated only on the base of the price development and the dividend yields. Even the fund with the better performing portfolio of assets can therefore produce worse net return in case of charging higher fees, and vice versa.

Tab. 1 Review of the studies investigating the performance of the SRI indices

Author(s) of study and year of publication	Investigated entity	Years covered by study	Short description of study and its results
Sauer, 1997 [13]	Domini 400 Social Index	1986 – 1994	In general, the risk-adjusted performance of the Domini index seems to be slightly higher than in case of the two conventional benchmark indices. The differences are only marginal and statistically insignificant, though.
Statman, 2000 [14]	Domini Social Index	1990 – 1998	The risk-adjusted return of the Domini Social Index was insignificantly lower than of its benchmark.
Schröder, 2004 [15]	10 SRI indices covering US, European and global markets	from the creation of particular index till 2002	The investigated indices generally showed slightly (but not significantly) better performance than their conventional peers. Only one of them (Calvin index) significantly underperforms its benchmark.
Statman, 2005 [16]	4 US SRI indices	1990 – 2004	Compared to the benchmark S&P 500, the SRI indices performed insignificantly better. The relative performance of the SRI indices worsened with time.
Colisson et al., 2007 [17]	8 SRI indices of the FTSE family covering UK, US, European and global markets	1996 – 2005	In comparison with their FTSE benchmarks, the SRI indices performed better till the 2001, but worsened from this year on. Their complete risk-adjusted return is in fact the same as of their benchmarks.
Schröder, 2007 [18]	29 SRI indices covering US, European and global markets	from the creation of particular index till 2003	Out of the 29 investigated indices, only the performance of two of them differs from their benchmarks significantly, one in the positive and one in the negative way.
Consolandi et al., 2009 [19]	Dow Jones Sustainability Stoxx Index	2001 – 2006	The investigated index slightly underperforms its benchmark (DJ Stoxx 600), but this result is not significant and according to the author it is caused by large-cap bias.
Amenc, La Sourd, 2010 [20]	10 SRI indices covering European and global markets	2002 – 2009	Most of the SRI indices (the particular number depends on the used measure) performed slightly better than their benchmarks. Nevertheless, these outperformances are not statistically significant.
Huimin et al., 2010 [21]	7 SRI indexes covering the US market	2001 – 2009	The period in question was divided into three market regimes (defined by volatility and returns). The SRI indices in general performed slightly worse than the standard ones during the regime with low market volatility, but with the market volatility their relative performance increased. These effects are not significant, though.
Herrera, 2012 [22]	Mexican Sustainability Index	1991 – 2012	The SRI index has lower risk-adjusted returns during the investigated period.
Ortas et al., 2012 [23]	Brazilian Corporate Sustainability Index (BCSI)	2006 – 2010	BCSI performs the same as several conventional indices (including its official benchmark), but significantly worse than some others.

Source: own

Because the above mentioned issues reduce the reliability of the results obtained from the studies investigating the performance of the SRI funds, in our opinion it is better to use SRI indices for the research of the socially responsible investments. Thanks to the mechanical, on exact procedures based construction of the indices, these are immune to the above mentioned bias. As no fees are paid in case of the market indices, the second

potential distortion is irrelevant as well. A brief summary of the academic studies investigating the performance of SRI indices can be found in the Tab. 1.

As could be seen from the presented review, out of the eleven researches, which compared the risk-adjusted returns of the SRI and conventional indices, four of them resulted slightly in favour of the SRI, while three against it. In the rest of the studies the performance of both groups of indices is either the same or the discovered difference is limited to a particular time period, respectively it shows up only for certain indices. What is more, there is, in general, a serious lack of the statistical significance. To sum up, not even the studying of the SRI indices has lead to any decisive conclusion in the matter of the performance of the SRI in comparison with the standard investments so far, but in general it seems that there is no general difference between them.

2. Performance of the SRI in the changed situation

Nevertheless, researches mentioned in Tab. 1 investigated the performance of SRI indices in the economic reality which was quite different from the current situation. Seven of the researches covered only the time period before the current global economic crisis. In the rest of them except the last one, the years hit by the crisis (i. e. the year 2008 and the following years) constitute only a marginal part of the whole investigated period and their importance for the overall result of the study in question is rather low. It is therefore not sure, whether the conclusions of such studies are valid even for the economy during and after the global crisis.

When it had became clear that the global economy (and especially its Euro-American part) was facing the greatest slump since the Great Depression, voices arose saying that this problem had been caused by the lack of ethics and responsibility in the business and that only by putting emphasize on these values it is possible to overcome the present crisis and avoid its recurrence in the future. According to some authors ([1], [24], [25], [26]) the concept of the social responsibility is the key factor which can help companies to get over the critical years. Unfortunately, it is beyond the scope of this paper to judge whether these statements of the social responsibility as a silver bullet are based on reality or whether they are only glossy phrases. Nevertheless, for the purpose of the SRI it is in fact not important whether they are true, but whether the people think that they are true. If people believe these arguments (regardless of their real validity), they would prefer the shares emitted by the socially responsible companies to the standard stocks, i. e. the demand for the SRI assets would rise. Because the prices of the stocks are constituted by the interaction of supply and demand, then (ceteris paribus) this belief will ultimately result in the growth of the price of the SRI assets. In other words, assuming the above introduced opinions become accepted by a sufficient part of the investors, a positive difference should emerge between the performance of the socially responsible and the conventional investment during the crisis. The aim of the empirical part of this article is to investigate whether this effect has really appeared, i e. whether the SRI has became more advantageous in the current economic situation.

3. Data description

Nine major SRI indices were chosen as the representatives of the socially responsible investments – three for the European, US and global market. The performance of each of them was evaluated in comparison with its official conventional benchmark. The chosen SRI indices (together with the short description of their principles) and their benchmarks are noted in Tab. 2.

Tab. 2 Investigated socially responsible indices and their benchmarks

Responsible index	Short description of the principle of the index	Benchmark index
FTSE4Good Europe	Indices combine both negative and positive screening. Tobacco producers and companies manufacturing military systems or components of nuclear weapons are excluded from this index. Other enterprises have to fulfil the set of the ESG criteria so that their shares could be included.	FTSE All-World Developed Europe
FTSE4Good Global		FTSE All-World Developed
KLD 400 Social Index	The mechanism of the construction of the index contains negative and positive screening. Producers of tobacco, alcohol and adult entertainment are excluded from the index, and so are firms connected to military industry, nuclear power and genetically modified organisms. The rest of the companies have to perform well in the set of ESG criteria in order to be included.	S&P 500
MSCI SRI Europe	Indices mainly concentrate on the negative screening – producers of tobacco, alcohol and adult entertainment are excluded from the index, as well as firms connected to military industry, nuclear power and genetically modified organisms. Positive screening is also partially respected; included firms are not allowed to perform badly in the ESG criteria.	MSCI Europe
MSCI SRI Global		MSCI World
MSCI SRI North America		MSCI North America
MSCI ESG Europe	Indices work on the best-in-class principle. I. e. the companies with the best results in the set of environmental, social and governance criteria within every sector are included.	MSCI Europe
MSCI ESG Global		MSCI World
MSCI ESG North America		MSCI North America

Source: Own

As our intention was to investigate, whether there seem to be any changes in the attitude of the investors toward the SRI caused by the crisis, we chose April 2009 as the start of our study period. After the several signals of problems, which appeared during 2007, the crisis fully impacted the financial markets in 2008. During this single year, the Dow Jones Industrial Average index loss was 33.84 % of its value, while in case of the S&P 500 it was 38.49 %. In the European markets the situation was not better, with the 31.33 % decline of FTSE 100 and 45.25 % decrease of EURONEXT 100. Both in the US and in Europe the bottom was touched during March 2009. Setting the beginning of the study on the following month should therefore ensure that the results would be cleansed of the huge drop caused by the first panic and would really show only the reaction of the investors on the new situation. The end of the research was planned for 1th January 2013. The data for the first trading day of every month during the investigated period were used, which means the set of 46 values for every index.

Monthly logarithmic returns for each index were calculated. So as to calculate the average monthly return, geometric mean was used. The standard deviation of the monthly returns served as the measure of their variability for each index. In order to compare the risk-adjusted return of the socially responsible indices to their conventional benchmarks, we used the extended version of the Sharpe ratio known as the Excess standard-deviation-adjusted return ("eSDAR" in short) indicator [14], [16]:

$$eSDAR = R_F + \left(\frac{R_{SRI} - R_F}{\sigma_{SRI}} \right) \cdot \sigma_B - R_B , \quad (1)$$

where R_F is the risk-free interest rate (1M EURIBOR was used for the indices concerning the European market and 1M USD LIBOR for the global and North American indices), R_{SRI} is the mean monthly return on the socially responsible index, R_B is the mean monthly return on the benchmark index, σ_{SRI} is the standard deviation of the returns on the SRI index and σ_B is the standard deviation of the returns on the benchmark index.

In this case the eSDAR indicator means the excess return of the socially responsible index over the conventional one, where the SRI index is transformed to have the same standard deviation as its benchmark. If both the socially responsible and the conventional indices show the same return and risk, the eSDAR will equal zero. If not, the difference (assuming all returns are in percentage) is the gap between the return on the SRI and the standard index expressed in percentage points.

4. Results and discussion

Results for the particular indices are noted in Tab. 3.

Tab. 3 Excess standard-deviation-adjusted returns on SRI indices

SRI index	R_{SRI} [%]	σ_{SRI}	R_B [%]	σ_B	R_F [%]	eSDAR
FTSE4Good Europe	0.888	4.625	0.726	6.715	0.678	0.257
MSCI SRI Europe	1.066	4.210	0.900	4.277	0.678	0.172
MSCI ESG Europe	0.984	4.133	0.900	4.277	0.678	0.094
KLD 400 Social Index	1.138	4.276	0.996	5.320	0.260	0.357
MSCI SRI North America	1.103	4.296	1.188	4.458	0.260	-0.053
MSCI ESG North America	1.137	4.519	1.188	4.458	0.260	-0.063
FTSE4Good Global	0.903	5.579	1.043	5.351	0.260	-0.165
MSCI SRI World	0.987	4.889	1.008	4.930	0.260	-0.014
MSCI ESG World	1.000	4.960	1.008	4.930	0.260	-0.012

Source: Own computation

As can be seen from Tab. 3, every computed eSDAR differs from zero, i. e. it could seem that there are some variances between the risk-adjusted returns on the socially responsible and the standard indices. The observed differences appear both in the positive and in the negative direction and are therefore not consistent with the above formed hypothesis that the global crisis could lead to the shift of the investors towards the SRI. But the question is whether these differences are statistically significant, or whether they are caused only by a random distortion. The student's T-test was used so

as to investigate, whether the expected value of the eSDARs of the SRI indices is significantly different from zero. The test statistics have the following form:

$$t_{stat} = \frac{X_{AVG} - \mu_0}{\sigma} \cdot \sqrt{n}\,, \tag{2}$$

where X_{AVG} is the average of the sample, μ_0 is the tested expected value, σ is the standard deviation of the sample and n is the count of the observations. A two-tailed T-test on the alpha = 5 % was used with the null hypothesis $\mu_0 = 0$. As could be seen from the Tab. 4, the conducted test does not allow us to reject the null hypothesis and we therefore cannot claim the risk-adjusted performance of the SRI indices to be significantly different from the conventional ones during and after the crises of the financial markets.

Tab. 4 Result of the T-test

X_{avg}	0.064
σ	0.170
μ_0	0
n	9
$t_{(1-0.05/2;\ 8\ D.\ F.)}$	2.306
W_{crit}	$(-\infty; 2.306) \cup (2.306; +\infty)$
t_{stat}	1.124

Source: Own computation

Conclusion

Social responsible investing is an extremely successful financial innovation whose popularity has been rapidly growing during the last decade. Nevertheless, the question whether this concept is also financially advantageous for the investor has not been solved so far, because the conducted studies have brought rather ambiguous results. What is more, they mainly focused on the period before the global financial crisis, when the state of economy was different from the current situation in many respects. Nowadays influential voices can be heard saying that the crisis taught us that the socially responsible behavior is the future of the business. The main aim of our paper was therefore to find out whether these ideas were reflected even on the financial markets – i. e. to investigate the risk-adjusted returns on the socially responsible investments in comparison with the conventional ones during the period following the market crash in the year 2008 and early in the year 2009. As for the research method, we chose the comparison of the performance of the SRI and the standard stock market indices using the Excess standard-deviation-adjusted ratio.

According to the obtained results the risk-adjusted returns of the SRI differ slightly from the conventional investments. The post-crisis superiority of the socially responsible investments over the standard ones has not yet been confirmed, though. Firstly, the variances between the performance of the responsible and standard assets appeared in both directions, not only in favor of the SRI. Secondly, these differences are not statistically significant. It means that from the financial point of view the SRI remains to be the equal alternative to the conventional investments even under the current

conditions. Allocating money to the "responsible" assets does not bring any advantages to the investor, but on the other hand, it does not require any sacrifice either. The results of our study are therefore consistent with the previously conducted research studies.

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Structure of Governments and Inflation in CEE Countries

Abstract

This paper deals with the political-economic relationships of the coalition governments in the countries of Central and Eastern Europe. The added value of this paper is in its approach to testing the relationship of the political and economic characteristics in the whole region of Central and Eastern Europe, especially for coalition governments. This approach has rarely been applied in recent literature.

We used panel regression with fixed effect. Data revealed that the level of the incumbent government's majority in parliament is statistically significant and that the estimates showed a tendency of inflation to decrease by 0.22 pp in the case when the majority of the coalition increases by 1 percent. Single-party government and government with a minimal winning coalition (all parties in the government are necessary to form a majority in parliament) statistically significantly influenced the inflation even more and in comparison with other types of government, decrease the inflation by approximately 3 pp.

There were also statistically significant estimates for public expenditure and economic growth. The inflation estimate increased in the case of an increase in public expenditure or an increase in economic growth in Central and Eastern European Countries. Both relationships are predictable using economic principles.

The number of political parties did not appear statistically significant in any of the tested models. The same situation appeared in the case of the variable concerning the prime minister belonging to the strongest political party in the coalition government.

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Key Words

coalition governments, Central and Eastern European countries, economic policy, inflation monetary policy, panel data, government ideology

JEL Classification: E52, E58, D72, C23

Introduction

The relationship between various economic and political issues is widely discussed. This paper tries to add something concerning the role of coalition governments' influence on monetary stability (inflation). The paper focuses on Central and Eastern European countries, which witnessed a transition and then joined the European Union. The main objective of the paper is to answer the question whether coalition governments had any influence on economic performance in Central and Eastern European Countries.

The paper is organized as follows. The first part is dedicated to economic policy and politics' influence on inflation. Then there is a description of data collection. Special attention is paid to this, as the data and methodology are crucial for the plausibility of the results. The third chapter concerns the model and methodology of statistical data processing. The following chapter discusses the results. The final chapter concludes.

1. Politics and inflation

The usual approach is to view coalition governments from the political science aspect. To see them from the economic perspective is quite rare. [3] and [12] dedicated their effort to this topic. However, even in those works little attention has been given to the political orientation and the structure of coalition governments.

The influence of political parties' on inflation is divided into the roles of the parties of conservative or social democratic groups. [8] even mentions price stability as being the highest goal of economic policy for conservative political parties. On the contrary, left-wing parties are aimed at fighting against unemployment. Thus, those two groups differ in their approach and it can be expected that empirical analysis will prove the influence of political parties' right – left leanings on inflation.

The influence of economic policy on economic performance (including price stability) and on election results was studied using the political-economic cycle approach in the last couple of decades [for example see [11]; [1]; [6]. These studies tested whether the governments utilize economic policy tools to try to trade-off (mainly) between inflation and unemployment in the short term. According to these studies the non-central bank subjects can play the significant role in the influencing of inflation. For the potential role of central bank see [4]. The most recent findings concerning interest rates are that the key role is the independence of central bank. Leftist governments have lower short-term nominal interest rates in case the central bank independence is low. In contrast, short-term nominal interest rates are higher under leftist governments when central bank independence is high." [2]. They mention also the discussion of Central Bank Independence and channels of transmission and also for the excellent overview of empirical tests of partisan monetary policy from 1995 to 2009. The role of central bank is not the main theme in our paper, however.

2. Data

This study focused on the influence of governmental political characteristics in parliamentary democracies on the monetary stability. We study the Central and Eastern European Countries (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Poland, Slovakia and Slovenia). Those countries passed through a transitional period during the 1990s and started to behave as standard democratic systems afterwards. There are two main groups of data used in this paper – the political one and the economic one.

The statistical analysis used in this paper (described below) is very demanding on the quality and extent of data. The analysed data set covers 13 years (beginning in 1993). The data set covers the transitional and post-transitional periods for all countries in question. The data for countries such as Poland, Hungary and the former Yugoslavia before 1993 might be interesting, but incomparable with other countries in the region. The data for the succession states in the former Yugoslavia was not included into the research as many of them were at war and in an unstable situation and the question of the economic situation was definitely not top of the list of political importance. There is also a problem with the data concerning the fluctuations and stability of party systems in Central and Eastern European Countries.

2.1 Data concerning economic situation

The economic data is based on quarterly information, as it makes it possible to take into account the precise timing of cyclical fluctuations in relation to elections. As relevant economic variables were chosen the quarterly data for the consumer price index (as inflation, INF), the economic growth (GRO, measured as a percentage difference of the GDP per capita in relation to the previous quarter of the year), the unemployment rate (UNP), the balance of payments (FOR) and the relative change of the "government expenditure to GDP" ratio. To ensure comparability of all economic data and the same methodological approach for all data, the International Monetary Fund (IMF), OECD data and the European Statistical Office data were used. The main part of the data is of IMF origin.

2.2 Data concerning the political situation

The second group of data represents political data. There are more methodological complications with political data in comparison with economic data. The data on political coalitions and the proportion of power in the parliaments are based on several sources.

There are two main sources of political data concerning the left-right position of the governments used in this paper. The first data sample is based on the analysis by [10] of the governments in Central and Eastern European democracies. The countries for which the political-economic situation is tested in this paper are included in this data set. Those countries are: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Finally Latvia and Romania were not used in the analysis in this paper, as the economic data for those two countries was incomplete. This data was compared and supplemented by missing data, especially the data set for 2003 – 2005. That additional period is the period when the governments in question were still ruling until the end of 2005. The political character of coalition governments was based on the information gathered from several sources [5]. The methodology of collecting political data is the same as in [5], although the most crucial information concerning the political character of particular parties participating in governments is

missing. This type of positioning of political parties on a left – right scale doesn't change in the long-term and is more static than the following one.

The second methodology used for positioning of governments in the left-right space is taken from [9]. This methodology is based on the approach that many countries witnessed a situation in which political parties´ positions changed. Such a situation was also described in the case of Western countries. [9] shows that considering elections from 1945 to 1959 in Great Britain, the normally rightist conservatives moved from right of centre in 1945 to well within the left in 1955.

3. Econometric model

The main aim of this analysis is to analyse whether common economic and political variables are able to explain the variance of our key explained variable – inflation. The attention is focused on political variables, especially the type of government. We tested the following econometric model:

$$INF = f\begin{pmatrix} GRO, UNP, FOR, POW, NUM, CAR1, DCAR1, \\ CAR2, DCAR2, TOG, TIM, PREM, AFTER \end{pmatrix}, \quad (1)$$

where: INF is the inflation rate (CPI); GRO is the gross domestic product (per capita) growth. It is a percentage of the difference of the GDP per capita in relation to the previous quarter of the year; UNP is the unemployment rate. It is measured as a percentage of unemployed people in the given economy's workforce; FOR is the balance of payments; POW is indicator of government majority power. The numbers above 50 % indicate majority governments, below 50 % indicate minority ones. This value is measured by the number of seats in Parliament, not by the share of votes in the elections; NUM is the number of political parties taking part in the ruling government; CAR1 is the political character of the government. The value of this variable ranges from 1 (Communist parties) to 14 (Single – issue parties). See appendix for details; DCAR1 is derived from the CAR1 variable. This variable determines the political heritage of the previous government. It uses the following form: $CAR2 = CAR(t) - CAR(t-1)$. Thus, this variable is below (above) zero in the situation when the previous government was more to the right (left) on the left-right scale in comparison to the incumbent government. This variable is equal to zero in the case of the same government (consistent with the previous government). CAR2 is the complex political character of the government focusing on the level of planned economy, market economy, welfare,... (see appendix for more details). DCAR2 is derived from the CAR2 variable (compare with DCAR1 and see appendix). Thus, this variable decreases (increases) in a situation when the previous government was more to the right (left) on the left-right scale in comparison to the incumbent government. This variable is equal to zero in the case of the same government (consistent with the previous government). EXP denotes the percentage of the government expenditure (capital and noncapital) related to GDP in a particular country. TOG indicates the type of government according to the [10] classification. This variable was used as a dummy variable. In fact there are six variables TOG1 – TOG6 according to the situation of the government in question (e.g. if the government was a

single-party majority government, the TOG1=1, TOG2 to TOG6 are then equal to 0). TOG6 was used as a reference category [7]. For more details see appendix. TIM is used to control for the influence of time elapsed since the election. It is measured by quarters after the nomination of the government. For example, the value for the first quarter (0 – 2nd months) is 0, for the second quarter (3rd – 5th months) the value of this variable equals to 1, etc. PREM denotes the situation when the strongest political party in the ruling coalition occupies the seat of the prime minister (0 means that the prime minister is a member of another political party other than the strongest one in the coalition government, 1 denotes that the strongest party occupies the seat of the prime minister). AFTER is a variable used for differentiating transitional and post-transitional periods. It is 0 for 1993 – 1999 and the value is 1 for the period 2000 – 2005. Such a split is also based on [9].

All qualitative variables passed common test for their stationarity. We used panel regression with fixed effect as proposed by [7] to be able to control for the differences between countries. The final model is presented in the next table. To improve the quality of model we employed some "auxiliary variables" – the autoregressive term (AR1), and to deal with the seasonality we utilized the standard procedure based on the seasonal dummy variable. The overall quality of model is sufficient, the R2 is 0.55 (which is comparable with other similar studies) and Durbin-Watson stat. (2.15) indicates there is not a problem with autocorrelation of residuals. According to the F-test we can reject the null hypothesis that all the country effects are zero. The autocorrelation of residuals was tested by Durbin-Watson statistics. The results of regression are showed in table 1.

Tab. 1 The final model for the inflation as dependent variable

Variable	Coeff.	Std. Error	t-Statistic	Prob.
Political variables				
TOG1	-3.78	1.52	-2.48	0.014
TOG2	-2.22	1.17	-1.90	0.059
POW	-0.22	0.10	-2.16	0.031
Economic variables				
EXP	0.32	0.12	2.72	0.007
GRO	1.32	0.05	26.74	0.000
Auxiliary variables				
S3	-19.83	2.16	-9.19	0.000
S4	-18.45	2.31	-7.99	0.000
AR(1)	-0.13	0.06	-2.04	0.042

Fixed Effects	**Coeff.**
BUL--C	12.6
CZ--C	14.8
EST--C	14.0
HUN--C	12.8
LIT--C	16.5
POL--C	15.7
SLO--C	13.3
SVK--C	14.8

Diagnostic tests

R-squared	0.65	Mean dependent var	2.64
Adjusted R-squared	0.55	S.D. dependent var	13.74
Durbin-Watson stat	2.15	Prob(F-statistic)	0.00

Source: own calculation using Eviews 6.

It reveals that statistically significant, are public sector expenditure (EXP), with estimates showing a positive relationship between inflation and public expenditure. It seems there is also a statistically significant influence of seasonally adjusted economic

growth. A growing economy is connected with increasing price levels. These conclusions fit the mainstream economic theoretical assumptions.

Conclusions

The most interesting result concerns the relationship between the incumbent government (POW) having a majority in parliament and inflation. Regression estimates show that a higher majority is connected with lower inflation. In more detail, the regression estimates show a tendency of increasing parliamentary majority leading to decreasing inflation. The estimates of the relationship show that if the majority increases by one percentage point, the estimated inflation decreases by 0.22 percentage points. Single-party government (TOG1 – just one party holds the majority in parliament necessary for ruling the country and also holds all the seats in the cabinet) and government with the minimal winning coalition (all parties in the government are necessary to form a majority in parliament) statistically significantly influenced the inflation (see negative coefficient). Other statistically significant estimates fit economic theories. In particular those are the relationships of public expenditure (EXP) and inflation and economic growth (GRO) and inflation. Growth in public expenditure usually causes a growth in inflation and higher economic growth is connected with higher inflation.

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Annex – List of variables

- GRO is the economic growth measured as the difference between two quarters in the country in question. It is a percentage of the difference of the GDP per capita in relation to the previous quarter of the year.
- INF is the inflation rate in a particular country and quarter of the year. It is measured by the consumer price index.
- UNP is the unemployment rate in a particular country and quarter of the year. It is measured as a percentage of unemployed people in the given economy's workforce.
- FOR is the balance of payments measured quarterly.
- POW is a variable indicating what kind of majority had the ruling coalition. It is measured as a percentage of the whole legislature in parliament. The numbers above 50 % indicate majority governments, below 50 % indicate minority ones. This value is measured by the number of seats in Parliament, not by the share of votes in the elections. A majority is important, as a coalition usually needs a majority in Parliament for a vote of confidence.
- NUM is the number of political parties taking part in the ruling government.
- CAR1 is the political character of the government. This indicator describes the weighted average of the parties included by: $CAR = \sum_{i=1}^{n} \frac{Pi}{\sum Pi} PFi$, where i indicates ith party of n parties in the coalition government, PFi indicates the appropriate political group, whose political programme is closest to the ith party. The value of this variable ranges from 1 (Communist parties) to 14 (Single – issue parties). Categories 13 (Regionalist parties) and 14 are rare, thus the usual value of this variable ranges from 1 to 12 (Right-wing and nationalist parties).
- DCAR1 is derived from the CAR1 variable. This variable determines the political heritage of the previous government. $CAR = CAR(t) - CAR(t-1)$. Thus this variable is below (above) zero in the situation when the previous government was more to the right (left) on the left-right scale in comparison to the incumbent government. This

variable is equal to zero in the case of the same government (consistent with the previous government).

- CAR2 is the political character of the government. Using this approach, a government's policy position is the weighted mean score of parties in government on each of the six policy scales covered in this methodology: Left-Right, planned economy, market economy, welfare, international peace, and EU scales. Weights are the proportion of parliamentary seats held by each party in the government. The few governments identified as non-partisan are reported as missing data. It includes not only economic variables, but also variables concerning military and peace positions, human rights questions and others.
- DCAR2 is derived from the CAR2 variable in a same way as DCAR1. This variable determines the political heritage of the previous government. Thus, this variable decreases (increases) in a situation when the previous government was more to the right (left) on the left-right scale in comparison to the incumbent government. This variable is equal to zero in the case of the same government (consistent with the previous government).
- EXP denotes the percentage of the government expenditure related to GDP in a particular country and yearly quarter.
- TOG indicates the type of government: 1) Single-party government (just one party holds the majority in parliament necessary for ruling the country and also holds all the seats in the cabinet). 2) Minimal winning coalition (all parties in the government are necessary to form a majority in parliament). 3) Surplus coalition (coalition governments exceeding the minimal winning criterion, which is met in type 2). 4) Single-party minority government (the party in government does not have the majority of the seats in parliament, but has all the seats in the cabinet). 5) Multi-party minority government (similar situation to 4, including 2 or more parties in the government, which do not have the majority of seats in parliament). 6) Caretaker government (these governments are temporary or they are governments with support across the whole political spectrum for a pre-agreed period).
  This variable was used as a dummy variable to avoid using a discrete variable in the model. In fact there are six variables TOG1 – TOG6 according to the situation of the government in question (e.g. if the government was a single-party majority government, the TOG1=1, TOG2 to TOG6 are then equal to 0).
- TIM classifies the regression value of the time during which the government rules. It is measured by quarters after the nomination of the government. For example, the value for the first quarter (0 – 2nd months) is 0, for the second quarter (3rd – 5th months) the value of this variable equals to 1, etc. The beginning of the government is determined by the nomination of the prime minister, not the vote of confidence vote in Parliament.
- PREM denotes the situation when the strongest political party in the ruling coalition occupies the seat of the prime minister (0 means that the prime minister is a member of another political party other than the strongest one in the coalition government, 1 denotes that the strongest party occupies the seat of the prime minister).
- AFTER is a variable used for differentiating transitional and post-transitional periods. It is 0 for 1993 – 1999 and the value is 1 for the period 2000 – 2005.

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Innovative Business and the Czech Republic

Abstract
Innovative activities should generally be regarded as the key area of economic development. Innovations can bring a company competitive advantage and can help to improve competitive position in the market. The paper points out the contribution of innovation and innovative business, which have a significant impact on the competitiveness of companies, or region. From the survey which was carried out in the Department of Management and Business Administration of School of Business Administration in Karvina in the Czech Republic in the year 2011 under the title "Adaptability of SMEs in the current economic conditions in the crisis years 2007 – 2010" one of the objectives of the research was to analyze and evaluate whether firms innovated in the crisis years and what types of innovations where the most frequently in the period. In order to evaluate the survey there was used program SPSS 11.5. The paper deals with innovative business and innovation performance of the Czech Republic. The aim of the paper is to evaluate innovative business in the Czech Republic and the innovation performance of the Czech Republic on the basis of primary and secondary research. Businesses have to monitor and evaluate innovation activities in order to maintain their competitiveness, therefore the paper indicates areas which are important to monitor, measure and evaluate in the context of the current time in the area of innovative inputs and innovative performance. The paper is supported by the Student Grant System of Silesian University in Opava, School of Busienss Administration in Karvina under number SGS/9/2012.

Key Words
innovation, performance, measurement, innovative business

JEL Classification: L20, L26, R11

Introduction

Innovation is a deliberate and beneficial change in the status quo, which has to find a practical application, and has to be at least new for a company. Objects of changes are products, services, staff, manufacturing, technical and technological procedures, organizational processes, including changes in the economic processes of qualification, but also changes of the market. The result of implemented changes should bring a benefit, whether economic, technical or societal.

Already from defined definition innovation would not be an everyday event, but such an event or fact, which has the ability to redefine the scope and boundaries – opening up new opportunities and it is also a challenge for existing players, in order to change

something in part of the new conditions. Innovation can be understood as a general activity necessary for the survival and growth of the organization.

According to Švejda [10] innovative business is then understood as a set of business activities specializing in the continuous realization of innovative activities. In relation to research and development object of business should be commercialization of results of research and development on the market. The transfer of technology is an important tool. The process of innovation begins with an innovative business plan, it ends not only by the application of new products in the market and by evaluating the parameters of products, but there is also important thoughtful way of their disposal (recycling) after the end of their life cycle. The beginning and end of the innovation process is influenced by innovation (technology) marketing.

1. Statistics of Innovative Companies in the Czech Republic

According to the Eurostat methodology, updated for the year 2010, innovation (innovative) firms are those firms which in the period 2008 – 2010 either introduced product innovation or process innovation or they had ongoing or abandoned activities (technical innovation), or implemented marketing or organizational innovations (non-technological innovation). Starting from the year 2008 the CIS survey the non-technical innovation has been equated with technical innovations.

In the Czech Republic in the period 2008 – 2010 there innovated 49.9 % of economically active enterprises. The share of non-innovative enterprises reached 50.1 %. The highest proportion of innovative enterprises was in the group of large enterprises with more than 250 employees (75.5 %), the smallest share of innovative enterprises was found in small enterprises (46.3 %). In the group of medium-sized enterprises innovated 59.7 % of enterprises. In terms of ownership of enterprises there innovated more foreign-controlled enterprises (63.0 %) than domestic firms (47.2 %).

By comparison with the previous period 2006 – 2008 there occurred in the period 2008 – 2010 the increase of the share of innovative enterprises from 42.0 % to 49.9 %. There was most the share of innovative enterprises of small businesses, from 37.2 % in 2006 – 2008 to 46.3 % in the period 2008 – 2010. For medium sized businesses the increase between the periods was 2.6 percentage points. For large companies the situation was reversed, there was a slight decrease in the share of innovative enterprises from 76.0 % in the period 2006 – 2008 to 75.5 % in the period 2008 – 2010. In the case of foreign affiliates the increase in the share of innovative enterprises was greater than that of domestic firms.

In the period 2008 – 2010 the largest share of innovative enterprises was recorded in the area 'Information and communication' (70.2 %). It was followed by the area "Financial and insurance activities" with a share of 66.1 % of innovative enterprises. The third most important sector in terms of the share of innovative enterprises was the sector "Manufacturing" (56.4 %). The least innovate enterprises were in the area

"Administrative and support services" (the share of innovative enterprises 37.0 %) and the area "Accommodation and food service activities (37.1 %).

According to the broader concept of innovation in the revised Oslo Manual 2005 there were identified four main types of innovation: product innovation, process innovation, marketing innovation and organizational innovation. This classification maintains the highest possible degree of continuity (to ensure comparability of data) with the previous definition of technical product and process innovation used in the previous second edition of the Oslo Manual 1997. Product innovation and process innovation are closely related to the concept of technical product innovation and technical innovation process. Marketing and organizational innovations in comparison with the previous definition extend a number of innovations covered by the Manual and is one of the non-technological innovation.

In the Czech Republic, the share of technical innovation (product or process) in the period 2008 – 2010 which is considered in innovation as key innovators there was 31.6 % of the total number of economically active enterprises. The highest proportion of enterprises with technological innovation was in the group of large enterprises with more than 250 employees (62.9 %). In the group of medium-sized enterprises there technically innovated 42.2 % of enterprises. The smallest proportion of enterprises with technological innovation was in case of small firms (27.5 %). In terms of business ownership there technically innovated more companies under foreign control (46 %) than domestic firms (28.6 %).

In comparison with the previous period 2006 – 2008 there was in the period 2008 – 2010 the increase of the share of enterprises with technological innovation (from 28 % to 31.6 %). Most increased the proportion of enterprises which innovated technically in the group of small enterprises from 23.3 % in the period 2006 – 2008 to 27.5 % in the period 2008 – 2010. For medium sized businesses there occurred between to a slight decline of 0.2 percentage points between the periods. For large companies, there was also a slight decrease in the proportion of enterprises with technological innovation from 63.3 % in 2006 – 2008 to 62.9 % in the period 2008 – 2010. The share of enterprises with technological innovation in area of domestic companies increased between the periods by 1.6 percentage points. For foreign affiliates, the increase of innovative activities related to products and processes was more pronounced. The share increased from 33.4 % in the period 2006 – 2008 to 46 % in the period 2008 – 2010.

The highest proportion of enterprises with technological innovation by CZ-NACE r2 was registered in the area 'Information and communication' (54.1 %), followed by the area "Financial and insurance activities" with a share of 49.6 % of enterprises with technological innovation. Third most important area in the industry key sector as for the share of innovative enterprises there was the sector "Manufacturing" (43.3 %). The least technically innovate enterprises were in the area 'Administrative and support services "(the share of innovative enterprises was 14.3 %) and the area "Construction "(17.4 %).

In the period 2008 – 2010 from the total number of technically innovative enterprises only 34.2 % enterprises cooperated on the introduction of technical innovations with an

external partner. Large technically innovative enterprises cooperated more (62.1 %) than medium (45.9 %) and small enterprises (25.1 %).

For the technically innovative firms there were the most common co-operating partners in innovation suppliers of equipment, materials, components or software (mentioned by 23.9 % of firms). Important role as a cooperating partner played clients or customers (19.2 %). The least frequent trade partner for technical innovation there were government and public R & D institutions (6.9 %). Top ranking partners with whom technically innovative enterprises cooperated is the same in size groups of enterprises. For all size groups of enterprises there prevails the product innovation over process innovation.

From the research of Rylkova [8] there was found that only 13 % of selected sample (300 organizations) from the Czech Republic consider cooperation of small and medium sized companies as the main factor of innovation background in the company. As for SME´s cooperation with other firms, only 34 % asked cooperate on new product or proces development. Table 1 evaluates the development of innovative enterprises in the Czech Republic.

Tab. 1 Innovative Enterprises in the Czech Republic

Development of innovative enterprises	Share grows
Enterprises with technical innovation (product or process innovation)	Share decreases
Enterprises with non-technical innovation (organizational or marketing innovation)	Share grows
Manufacturing sector	Higher innovation performance
Service sector	Lower innovation performance
Large enterprises	Most innovatively active
Midle-sized enterprises	Less innovatively active
Small enterprises	Least innovatively active
Cooperation	Low level
Innovation performance	Moderate Innovator

Source: own

According to the SII (Summary Innovation Index) the Czech Republic ranks third position in the group of countries known as moderates innovators with SII value slightly below the EU-27 in recent years. Moderate innovators are countries reaching 50 to 90 % of the EU-27. The average innovation performance is measured using a composite indicator that takes into account the "innovative results" of countries based on 24 indicators, zero is the worst possible result, maximal possible result is assigned by value 1. In the year 2011 the average innovation performance reflects the real innovation performance in 2009/2010 – the reason is the time delay in disclosure of relevant statistical data.

Countries belonging to the innovative leaders (innovation leaders) are reaching at least 20 % higher innovation performance than the average for the EU-27, the so-called followers of innovation (innovation followers) are those whose innovation performance is within 10 % below average to 20 % above the EU-27 average. Performance of Moderate Innovators group of countries is lower than in the EU-27, but reaches higher

valuest than corresponds to 50 % of the EU-27. Countries with lower innovation performance belong to the group Moderate Innovators.

Czech Republic belonged according to rating dynamics of innovation performance (calculated on the basis of the development of the indicators making up the SII in the previous five years) with an average annual growth of 4.8 % among well above average among countries (average annual growth rate of the EU-27 amounted to 1.8 %) in the year 2009. In the year 2010, the average annual growth in innovation performance of Czech Republic was lower – only 2.6 %, while the average annual growth rate of EU countries amounted only 0.85 %. Thanks to economic growth in the year 2010 (mainly due to positive developments in the manufacturing and service industries), the current average annual growth rate of the innovation performance of the Czech Republic rose to 3.2 %. While in the year 2010 the value for the EU-27 was 0.85 % in the year 2011 average growth rate dropped to 0.33 % due to the impact of the economic crisis. In both years, the resulting growth rate is positively influenced by the development of indicators in open, excellent and attractive research systems, the negative impact was observed in indicators of corporate investment, in usage of venture capital (there decreased indicator – amount of funds designated as venture capital to HDP3) and in innovators group (decrease of innovative small and medium sized enterprises).

2. Own Research

Department of Management and Business of School of Business Administration in Karvina, Silesian University in Opava conducted survey under the title "Adaptability of SMEs in the current economic conditions in the crisis years 2007 – 2010. The research took place in the summer semester of the year 2011 with the help of full-time and distance students. Interpreted sample characterizes the state in 207 companies in the Czech Republic. The questionnaire was completed by the student on a personal meeting with a manager of company. The questionnaire survey included the following categories: A. Identification of the company (11 questions), B. Strategic and project management (9 questions), C. Risk and crisis management (11 questions), D. Personnel policy (7 questions), E. Production, services and innovative activities (9 questions), F. Use of grants and subsidies (8 questions), G. Energy savings and renewable energy (6 questions), H. Identification and intermediate student opinion survey (6 questions). [9]

In order to evaluate the survey there was used SPSS 11.5 program. Outputs were achieved with using several methods, for the purposes of this study there were selected three methods: Rotated Component Matrix (factor loadings after rotation, arranged by size), Communalities (part of variability explained by variables common factors) Correlation Matrix (mutual dependence of two questions).

One of the objectives of the research carried out by the department was to analyze and evaluate whether firms innovated in the years 2007 – 2010, and what types of innovations where the most frequently. As for the questionnaire survey conducted by the Department management and Business one of the hypothesis was *(H): Innovation activities in this period are concentrated primarily on product – goods or services.*

The results showed that 65.7 % of enterprises didn´t innovate, 34.3 % of firms innovated. Only 12 companies innovated something different and the rest innovated the product. The hypothesis was confirmed and is supported by the following table 2.

Tab. 2 Types of Innovation

Valid	Without innovation	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Without innovation	136	65.7	72.7	72.7
	Goods	13	6.3	7.0	79.7
	Goods, services	3	1.4	1.6	81.3
	Goods, technology	1	0.5	0.5	81.8
	Services	20	9.7	10.7	92.5
	Services, quality	2	1.0	1.1	93.6
	Services, technology	1	0.5	0.5	94.1
	Quality	4	1.9	2.1	96.3
	Quality, technology	1	0.5	0.5	96.8
	Design	2	1.0	1.1	97.9
	Technology	4	1.9	2.1	100.0
	Total	187	90.3	100.0	
Missing	System	20	9.7		
Total		207	100.0		

Source: [9, own evaluation by SPSS]

From the questionnaire survey conducted by the Department of Management and Business there was possible to point out areas that can have a high impact on the success of the organization.

Using SPSS program 11.5 there was found this structure of questions which attract the links with other questions and are most responsible for the results that came out after the evaluation of specified number (sample) of questionnaires. Questions correlation coefficient higher than 0.5 was found 36 times, but in order to remained the contribution clear and concise, there are only 3 of the most important issues with a correlation coefficient higher than 0.8 – Product and service innovation with correlation coefficient 0.809, Written strategy with correlation coefficient 0.805 and Measurement of performance with correlation coeficcinet 0.804.

According to Jiménez, Sanz-Valle [4] most of the broad empirical studies on the relation between innovation and performance provide evidence that this relation is positive ([Bierly and Chakrabarti, 1996], [Brown and Eisenhard, 1995 and [Caves and Ghemawat, 1992]; e.g. Damanpour, 1991; e.g. [Damanpour and Evan, 1984], [Damanpour et al., 1989], [Hansen et al., 1999], [Roberts, 1999], [Schulz and Jobe, 2001], [Thornhill, 2006], [Weerawardenaa et al., 2006] and [Wheelwright and Clark, 1992]). However, as Simpson et al. (2006) point out, innovation is an expensive and risky activity, with positive outcomes on firm performances but also with negative outcomes, such as increased exposure to market risk, increased costs, employee dissatisfaction or unwarranted changes. In addition, some studies arrive at conflicting conclusions. For instance, Wright et al. (2005), using a sample of small businesses, find that product innovation does not affect performance in benign environments, but has a positive effect on performance in hostile environments.

3. Measurement of Innovation Performance in Companies

According to Rejeb, Morel-Guimaes [7] literature attests of researches in the field of innovation capacity evaluation for a company or a country (Furman, 2003). These approaches are generally based on the evaluation of the innovation process outcomes and of the resources devoted to it. All these statements may be considered through three analytical levels setting aside the individual and collective cognitive level (Boly, 2004):

- Level A: The permanent and globalinnovation management of the company. This level integrates all the strategic tasks, the organization of new projects launching and the improvement of innovation management practices.
- Level B: The outcomes or inputs of a particular project. This level is characterized by a limited period and is concerned with the transformation of an idea up until an innovative product.
- Level C: The material characteristics of the innovative product resulting from the new product development process. This level represents the artefact of Level B. This approach suits our special interest in establishing links between evaluation and operational management tasks.The evaluation of Level C is very common in engineering through the definition of the future specifications of the innovative product and its relating performances.

According to Rejeb, Moredl-Guimaes [7] literature is mostly concerned with Level B evaluation. Many authors propose approaches to determine the balance between the outcomes and inputs of innovation. Generally, financial and commercial variables are taken into account (Griffin and Page, 1996; Huang et al., 2004; Kangmao et al., 2005). Financial evaluations are based on classical ratio including financial margins and returns on investment (Crepon et al., 2000). Moreover, specific financial criteria dedicated to innovation resources are suggested: they generally measure time and cost development (Grant and Pennypacker, 2006). Marketing variables include qualitative and quantitative aspects, such as new market shares and customer satisfaction (this last example is dedicated more to product's Level C than to the project's Level B). Strategic considerations, such as competitive advantage, are integrated to evaluate the balance between outcomes and inputs. Several authors (Archibugi and Pianta, 1996; Abraham and Moitra, 2001) add technological criteria, such as the number of patents, to conduct this evaluation.

According to Rylková [8] innovative capabilities are a kind of background for the emergence of innovations. Measuring innovation capacity can then be done by measuring the assumptions, that means inputs (factors of production) in the innovation process (associated with finding and collecting innovative ideas and ending with investment in staff training and in research and development). It is obvious that some conditions are relatively easily measurable (quantity), others very heavily (quality).

For measuring inputs there are most frequently used according to the experience of enterprises surveyed in Rylkova [8] operating costs, capital expenditures, number of employees allocated to specific activities related to innovation. The most common individual indicators measuring innovation capabilities are the research and

development expenditures for a given period, investment in new equipment and employee training, percentage of employees trained in the area of innovation, capital invested into the innovation, percentage of staff time devoted to innovation and number of innovative ideas. For measuring process there can be used metrics of the duration of the change the idea in the idea realization that means the movement within innovation process from one stage to the next one and the costs connected with the stages.

Innovation performance follows the innovative activities of the company but innovation activity it is not the property of the company. It is again the result of the innovation process and arises from interactions among competing firms in a given market situation. Innovation performance is generally considered as a crucial component of long-term competitiveness of countries and regions.

Innovation performance (evaluation of innovation implementation) stands up to the very end of the innovation process. For measurement it is necessary to understand and describe the whole innovation process and to identify factors that may affect the ultimate realization of innovation. Measuring output includes for example number of newly listed products, changes in market share, growth in sales and profit growth from sales of innovative products.

According to Košturiak, Chal' [5], it is useful to use the following indicators of innovation performance:

- Success of innovations: the number of successful projects to the total number of initiated innovative projects.
- Effectiveness of innovations: the real contribution of projects to the total cost of the project.
- Time of innovation: the average time implementation of innovative projects.
- Return on Innovation: the period during which benefits from an innovative project reach the project costs.
- Return on Innovation: return on investment in innovation.
- Total expenditure on innovation as a percentage of sales.

According to Rylková [8] measurement of innovation performance in a company should be connected with evaluation of these cathegories – realised innovation (number of implemented innovations during a period), success of innovation (number of successful projects to tohe total number of initiated innovative projects), time of innovation (average time implementation of innovative projects), acquired patents (number of patents for a certain period), economic indicators (return of innovation, total expenditure on innovation as a % of sales, real contribution of the project to the overall cost ot the project).

Conclusion

According to Vacek, Egerová, Plevný [11, p. 538] innovations today determinate the competitiveness of any organization; often they are pre-conditions of its survival. The

paper introduced innovative business of the Czech Republic on the basis of secondary research. From the primary research it may be inferred that the areas product and service innovation, written strategy and measurement of performance can have the greatest impact on the speed of adaptability of companies to changes and development.

Enterprises have to realize that they are surrounded with an external envirnoment that supports or does not support development. The company itself uses inputs that transforms into outputs, provides products or services and sovle problems such as where to obtain information, resources, customers, qualified staff, how to develop. The behavior of company influences the market. Influence of the market is becoming difficult, so i tis necessary for company to seek new forms of development and to establish new forms of cooperation. The innovation process is nowadays without intensive cooperation with R&D organizations, universities and other innovative parts of the region (also known as an innovative proces of „higher rank“.). This cooperation, which is still not so used in the Czech Republic, is one of the characteristics of the knowledge economy and is a source of competitiveness of firms and regions. Most of today's successful innovations are a combination of innovations, where combined products are the outputs of joint innovation activities carried out by individual members of networks. The linear model of innovation is being replaced with an interactive model. All of these areas should be included in the development strategy, which will also include prerequisites for innovation and lead to innovation effect. The innovation effect should include measurable results, balanced cost of capital, it should include both qualitative and quantitative criteria, it is necessary to monitor the market position and create and develop a corporate culture which is opened to innovation.

According to Pitra [6] innovation measurement can be assessed in two basic levels. Company´s level uses to the measure research that deals with the economical results and financing, motivation of employees, or there is applied customer satisfaction. It can include revenue from the sale of a new product, the cost of research and development, the length of the life cycle of the product or how the product is perceived by consumers. The second level is the political – and deals with the competitive advantages of regions or countries in which innovation plays its unique role. In this case, the innovation can be evaluated by using the areas dealing with technology, processes, or marketing.

According to Hadraba [3] measuring innovation should be carried out effectively, efficiently (must bring relevant information to the corporate management) and economically (must be done at a reasonable cost). Individual indicators generally meet the requirement of economy, but rarely effectiveness, as they focus on innovation from a too narrow view.

Evaluation of companies (either internal or external) should mainly serve the company management, which should be reflected in the results of the evaluation of its other activities and possibly the best practices should be used elsewhere. In the case of an enterprise or small group of companies it is possible to implement and measure a set of quantitative criteria. In the case of a large group of companies in different industries with very different objectives it is necessary to take a broad approach to the assessment.

The metrics for measurement of innovation performance of companies should be based on innovation strategy and planning, management, marketing, production, products, organization, quality and environment, logistics, organization and human resources because an important role plays promotion of innovation by management, the climate in the company, management systems, employee motivation etc. The question for discussion and future research is: What measures are the most important to evaluate within the product or process innovation?

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Customers' Online Shopping Attitudes in Relation to Their Online Shopping Experience

Abstract
Online shopping and the share of online buying population are growing. Customers' perceptions and attitudes of online shopping are seen as an important indicator of online customer satisfaction and their repurchase intentions. This paper presents partial findings of the research focused on online shopping in the Czech Republic conducted by the Department of Marketing, Technical University of Liberec in 2012. It examines the relationship between customers (Internet users) and online shopping as well as the impact of customer online shopping experience (shopping frequency and the amount of money spent by online shopping) on their perceptions and attitudes towards online shopping by applying a multi-attribute model. It was found that despite some identified differences in online shopping attribute evaluation and online shopping attribute importance analyzed by shopper experience, their attitudes towards online shopping can be perceived as very similar and very positive. This represents a great potential for the growth of online shopping in the Czech market in terms of the number of population and the amount of money spent by online shopping.

Key Words
on-line shopping, customer, perception, attitudes, experience

JEL Classification: M31

Introduction

The development of Internet and Internet commerce has made it possible to provide new kinds of added value for customers. Effective use of Internet technology offers many possibilities and advantages for both, companies and their customers. Internet used in communication, marketing activities and sales enables cost reduction and high supply chain effectiveness. [11] It represents a major source of competitive advantage, market penetration, innovation, technology transfer and management competency. [18, p. 187] Consumers buying products and services over the Internet get a better deal as well. [9], [19] Internet provides a lot of information and allows consumers easy and fast comparison of products and prices. Internet makes shopping online convenient and time saving. [6] This is the reason why consumers engage in Internet commerce and develop favourable attitudes towards online shopping.

Recent development shows that Internet user base including a share of online buying population is growing. Spending on a per user basis increases as well. It is evident that online shopping is gaining bigger sales and market share from traditional retailers. [10, p.

42] According to the research conducted by the Netmonitor in 2011, the Czech Internet population increased by 360,000 Internet users as compared to the previous year. Most of the Internet users (about 95 percent) have experience with online shopping. [12] In 2012, total online sales in the Czech Republic reached CZK 43 billion, which was by CZK 6 billion more than in 2011. The Christmas online sales in 2012 counted for CZK 17 billion. On average, one online shopper spent CZK 9,280 in 2012. The annual spending per online shopper decreased in 2012 in comparison to 2011 (CZK 11,659), however the number of online shoppers shopping over the Internet regularly has been growing. About 52 percent of online shoppers shop more than five times a year; 91 percent of them shop online at least once a year. [2] Almost 50 percent of them make online shopping once in three months. There are more men than women shopping online. Men spend more than women, although the frequency of online shopping is about the same. The most frequently bought products are computers, clothing, sport equipments and cosmetics. [7], [12], [13]

Online shopping attracts a lot of attention from practitioners and academics. Various aspects of online shopping have been examined for years. Customers' perceptions and attitudes of online shopping are seen as an important indicator of online customer satisfaction and their repurchase intentions. This paper presents partial findings of the research focused on online shopping in the Czech Republic conducted by the Department of Marketing, Technical University of Liberec in 2012. It examines the impact of customers' online shopping experience on their perceptions and attitudes towards online shopping. The objective was to identify any significant differences in customers' perceptions and attitudes towards online shopping by frequency of online shopping and the annual amount of money spent by online shopping in order to understand their attitudes and motivation for online shopping.

1. Conceptual framework of the customers' online shopping attitude study

Customer attitude is usually defined as the customer's global evaluation of a product/service offering. It is formed by customers' prior attitude, his or her perceptions of current performance, prior expectations about performance, and the discrepancy between the expectations and subsequent perceptions. [5, p. 2] Experience, information, customer preferences, satisfaction and lifestyle are among other factors that influence attitudes. [3] [4] There is no doubt that customer attitudes guide their behaviour. Customers who are satisfied with their purchase from a particular company are likely to develop favourable attitudes towards the product and/or company and become more loyal to it. The more positive attitude held with strong convictions, the higher probability that customer will buy a product or service.

Approaches, methodologies and techniques to measure customers' perceptions and attitudes have generated a lot of academic attention. Many methods of customer perception and attitude measurement have been developed from the methods used in psychology and sociology. [3] [15] Probably the most common methods used in the research of customers' attitudes are customer prototypes, semantic differential, open-end technique, multidimensional scaling, psycholinquistic and numerical comparative scales.

This paper explores customers' perceptions and attitudes towards online shopping by applying a multi-attribute model. The multi-attribute model measures customer attitudes as a function of their online shopping attribute perceptions and evaluations. The selected attributes are weighted by customers' importance of each attribute. [8] An overall attitude is stated as result of the evaluation of the online shopping attributes and the importance of the attributes to customers. [1] The concept used in the study defines customers' attitudes as an overall assessment of the utility of online shopping based on perception of benefits and risks associated with online shopping. The conceptual framework of the study includes the following attributes of online shopping used in the research for customers' attitudes measurement:

- Wide product assortment
- Lower prices
- Low time (search) cost
- Shopping convenience
- Goods return policy
- References from other online shoppers
- Risk related to goods order and payment
- Complicated claim policy
- Anonymity (no personal contact)
- Lack of physical contact (only virtual product presentation).

The differences in online shopping perceptions and attitudes are influenced by many factors such as demographic and socio-economic characteristics of customers, their personal values, lifestyle and shopping orientation. [14] Most of the research studies conducted in online shopping focused on exploring the impact of demographic and socio-economic characteristics on online shopping behaviour. As far as the online shoppers' perceptions and attitudes towards online shopping in the Czech Republic are concerned, it was found that the perceptions and attitudes of respondents vary more by their age rather than income. The most positive attitudes were expressed by the middle-age online shoppers who highly evaluated lower prices, low time cost and wide assortment offered by online shopping. The least positive attitudes towards online shopping were hold by the oldest age category of shoppers that appreciated references from other online shoppers, low time cost, goods return policy and shopping convenience. The youngest generation of online shoppers highly evaluated lower prices and wide assortment of products. [16]

This paper presents the findings related to the influence of online shopping experience on perceptions and attitudes of online shoppers towards online shopping. The online shopping experience was measured by the frequency of online shopping and the amount of money spent in online shopping.

2. Research methodology

There have been different approaches and sample selection criteria used in the research on customer perceptions and attitudes. To avoid potentially confusing problems in

studies, Schiffman, Dash and Dillon suggested to interview respondents that were known to be recent purchasers of a specific product category from examined types of retailers. [17] James, Durand and Dreves argued that perception studies should focus only on target market segments since different groups of customers consider different (store) attributes as important. The results of the study thus should not be "contaminated" by the attitudes of nontarget market customers. [8]

Respondents interviewed for the study, were Internet users who had some experience with online shopping. They were men and women of different age and income levels, selected by non-probability convenience sampling method using Internet web side as a device for completing the questionnaire. For this reason the sample does not fulfil the requirements for representative sampling. Data were collected by electronically-administered questionnaires. The research was conducted in the Czech Republic in the period of January – February 2012.

To understand and interpret the results of the research, descriptive analysis was used to get information on the perception and importance of the selected attributes for respondents when doing online shopping. The differences in online shopping attributes evaluation and importance were statistically tested by one-way ANOVA analysis. The multi-attribute model was used to explore respondents' attitudes towards online shopping.

2.1 Demographic and socio-economic profile of the respondents

The sample included 503 respondents. There were 45 percent men and 55 percent women in the sample. The average age of the respondent was 29 years. The largest proportion of the respondents (75 percent) was at the age of 15 – 34 years. About 20 percent of the respondents stated the age category 35 – 54 years. The respondents over 55 years represented only 5 percent. The youngest respondent was 16 years old and the oldest respondent was 79 years old. The sample consisted of 40 percent employed and 6 percent self-employed people. About 6 percent of the respondents were unemployed or pensioners. Approximately 42 percent of the respondents completed the secondary level of education and 41 percent of them achieved the university degree.

The respondents' average monthly per capita household income was CZK 15,800. The lowest income category with monthly household per capita income up to CZK 20,000 represented the largest percentage of the respondents (84 percent). The proportion of the respondents in the middle income category (CZK 20,000 – 40,000) represented 14 percent and the highest income category (over CZK 40,000) 2 percent.

3. Respondents' attitudes towards online shopping

As found by the research, one person in the Czech Republic made about 10 online purchases in a total value of CZK 15,800 per year in 2012 which was roughly the same amount as an average monthly per capita income stated by the respondents. The lowest

amount spent on goods bought online was CZK 500 per year, the largest amount stated by the respondents was CZK 120,000. However, most respondents (75 percent) shopped online less often. About 22 percent of them shopped 11 – 30 times per year. Heavy online shoppers shopping more than 30 times a year represented only 3 percent of all interviewed respondents. The distribution of respondents by their online shopping frequency correlated highly with the amount of money spent by online shopping. More than 77 percent of respondents spent less than CZK 20,000 a year. About 20 percent of them spent between CZK 20,000 and 60,000. Less than 3 percent of respondents spent more than CZK 60,000 a year.

Ten attribute dimensions considered to be specific for online shopping including six dimensions of benefits (wider product assortment, lower prices, low time cost, shopping convenience, goods return policy and references from other online shoppers) and four dimensions of sacrifices (risk related to goods order and payment, anonymity of the seller – no personal contact, complicated claim policy and lack of physical contact in terms of product presentations) were selected for measuring customers' attitudes towards online shopping by Likert scale where 1 meant very good evaluation, 5 very bad evaluation. The attitudes were examined by using a multi-attribute attitude model that considers the attribute evaluation and attribute importance. Table 1 shows the mean scores for each attribute measurement.

Tab. 1 Online shopping attribute evaluations

Attributes	Shopping frequency categories			Amount of money spent per year categories			Total
	A	B	C	1	2	3	
Lower prices	1.72	1.75	1.93	1.68	1.82	1.85	1.46
Lack of physical contact	1.74	1.70	2.14	1.68	1.93	1.85	1.73
Shopping convenience	1.91	2.07	1.97	1.93	1.99	1.91	1.78
Wide product assortment	1.86	1.80	2.14	1.81	2.07	1.92	1.85
Low time (search) cost	1.88	2.00	1.29	1.93	1.77	1.90	1.90
References from other online shoppers	1.90	1.93	2.43	1.91	2.00	1.92	1.92
Complicated claim policy	2.20	2.42	2.79	2.19	2.35	2.85	2.24
Goods return policy	2.31	2.46	2.93	2.32	2.36	2.62	2.34
Anonymity (no personal contact)	2.37	2.36	3.21	2.36	2.48	2.23	2.39
Risk related to goods order and payment	2.81	2.82	3.00	2.87	2.72	2.92	2.84

Note: 1 – very good attribute evaluation,… 5 – very bad attribute evaluation; Shopping frequency categories: A… less than 10 times a year, B… 11 – 30 times a year, C… more than 30 times a year; Amount of money spent categories: 1… less than CZK 20,000, 2… CZK 20,001 – 60,000, 3… over CZK 60,000.

Source: own research

When evaluating attributes of online shopping, the highest mean scores were given to lower prices, no need for physical (face to face) contact, shopping convenience, wide product assortment and possibility to get references from other online shoppers. Other attributes such as complicated claim policy, goods return policy, anonymity and risk related to the process of order and payment when shopping online were perceived as less favourable dimensions related to the disadvantages of online shopping.

The same dimensions were used to explore the online shopping attribute importance. The importance of selected attributes was evaluated by using the scale 1 – very important to 5 – not important. The mean scores of customer online attributes importance is shown in Table 2.

Tab. 2 Online shopping attribute importance

Attributes	Shopping frequency categories			Amount of money spent per year categories			Total
	A	B	C	1	2	3	
Goods return policy	1.61	1.50	1.86	1.59	1.58	1.77	1.59
Low time (search) cost	1.85	1.76	1.36	1.82	1.70	1.38	1.82
Lower prices	1.94	1.86	1.93	1.88	2.01	1.88	1.91
Complicated claim policy	2.17	2.08	2.00	2.12	2.21	2.62	2.15
References from other online shoppers	1.73	2.16	2.50	2.18	2.04	2.42	2.17
Anonymity (no personal contact)	2.15	2.32	2.50	2.21	2.09	1.98	2.19
Wide product assortment	2.43	2.14	2.83	2.39	2.34	2.39	2.38
Risk related to goods order and payment	2.40	2.41	2.79	2.37	2.46	2.46	2.40
Lack of physical contact	2.40	2.41	2.79	2.37	2.46	2.46	2.40
Shopping convenience	2.49	2.65	2.93	2.55	2.42	2.23	2.54

Note: 1 – very important,… 5 – unimportant; Shopping frequency categories: A… less than 10 times a year, B… 11 – 30 times a year, C… more than 30 times a year; Amount of money spent categories: 1… less than CZK 20,000, 2… CZK 20,001 – 60,000, 3… over CZK 60,000.

Source: own research

As stated by the respondents, goods return policy, low time cost, lower prices, claim policy and information about e-shop identification (anonymity) were perceived to be the most important attributes for online shopping. The other attributes – wide product assortment, risk related to goods order and payment process, lack of physical contact and shopping convenience were perceived to be less important.

Statistically significant differences in respondents' attribute evaluations by online shopping frequency were found in perceptions of claim policy, lack of personal contact, references, product assortment and the risk associated with goods order and payment. These attributes were evaluated less positively by those who shop online more often. The same segment of online shoppers (shopping often) evaluated time saving better than other online shoppers. No statistically significant differences were found in online shopping attributes perceptions by respondents according to their amount of money spent by online shopping.

The one-way ANOVA analysis identified statistically significant differences in importance perceptions of the following attributes: time, shopping convenience, references from others, anonymity, product assortment, a risk associated with goods order and payment. Whereas shopping convenience, references, product assortment, information about e-shop provider (no anonymity) and low risk related to shopping were found to be more important to the respondents with lower frequency of online shopping. The frequent shoppers considered time saving factor to be more important than the others. Statistically significant differences in importance attribute perception

were identified by respondents according to the amount of money spent by online shopping. Time saving and information on e-shop were considered to be more important for respondents spending high amount of money by online shopping. The shoppers with low value orders perceived the risk related to the order and payment process to be more important in comparison the other segments.

The findings of online shopping attribute importance (Table 2) together with the results on online shopping attribute evaluation (presented in Table 1) were used in online shoppers' attitude analysis. The total attitude scores towards online shopping were calculated for each online shopping frequency and amount of money spent category. The results including the total attitude towards online shopping are presented in Table 3.

Tab. 3 Attitudes towards online shopping by the frequency and amount spent by online shopping

	Shopping frequency categories			Amount of money spent per year categories			Total
	A	B	C	1	2	3	
Attitudes towards online shopping	44	45	51	44	46	48	44

Note: the most positive attitude (min. value) = 10, moderate attitude (average value) = 130, the negative attitude (max. value) = 250; Shopping frequency categories: A… less than 10 times a year, B… 11 – 30 times a year, C… more than 30 times a year; Amount of money spent categories: 1… less than CZK 20,000, 2… CZK 20,001 – 60,000, 3… over CZK 60,000.

Source: own research

Indices of multi-attribute model used for measuring online shoppers attitudes (see Table 3) show that online shoppers enjoy shopping over the Internet and have rather positive attitudes towards it. The attitudes of those shopping less frequently and spending less by online shopping seem to be slightly more positive than the respondents' attitudes of the other categories.

Conclusion

Based on the findings presented above, it could be stated that the perceptions and attitudes of online shoppers towards online shopping in relation to their experience vary mainly by the frequency of their online shopping. The attitudes of online shoppers according to the amount of money spent by online shopping correspond to the attitudes of respondents identified by their shopping frequency, although very few statistically significant differences were proved. Despite some identified differences in online shopping attribute evaluation and online shopping attribute importance analyzed by shoppers experience, their attitudes towards online shopping can be perceived as very similar and very positive (see Table 3). This is a great potential for the growth of online shopping in the Czech market in terms of the number of population shopping by online and the amount of money spent by online shopping.

Less experienced online shoppers evaluated the lower price, possibility to shop anytime without going physically to a shop, wide range of products and time saving by highest

scores. The attributes of online shopping appreciated by heavy online shoppers the most were time, favourable prices, shopping convenience and wide product assortment. Time was also the most important attribute for them when shopping online. It seems that the more experience online shoppers, the less risk conscious and afraid they are. They usually know e-shops where they shop, they have already built a trust so that the order and payment process is no longer a problem for them. On the other hand, the risk associated with the order and payment is still an important attribute for occasional online shoppers.

Online shopping offers many benefits to online shoppers by reducing their search cost and increasing shopping convenience. Information provided by Internet influences the online shopping experience and compensate for the lack of personal and physical contact. Shopping convenience is also well perceived by online shoppers and to some extent is probably taken for granted (as a part of online shopping) since it was ranked as less important attribute for online shopping.

The weak areas of online shopping requiring further improvement, as identified by the research, are related to the product return, claim policy, and the risk related to the order of goods and the way of payment. This area offers some potential for improvements and encouragement for online shopping. Companies providing online shopping should do their best to lower all risks and doubts related to online shopping. They should focus on building trust and relationships with their online customers. Doing so would lead to higher customer's satisfaction, positive attitudes and loyalty.

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Smart Approach to Documenting and Identifying the Culprits of Minor Traffic Accidents

Abstract

The paper deals with the concept of new information system that is proposed for automatized documentation of traffic accidents and subsequent determination of guilty or degree of fault of participants in minor traffic accidents. Initial part describes current methods for determining the degree of fault in traffic accidents. Special stress is given to "minor accidents", in which the damage level of each vehicle does not exceed CZK 100 thousand, and where is neither property damage of other subjects nor injury of any person. They are also indicated weaknesses of current method of determining the culprits of minor traffic accidents and possible negative consequences of current practices. Published data enable to estimate number of accidents which are not investigated by the police. Based on analysis of shortcomings of existing procedures is proposed new technological solution "crash terminal", allowing objective documentation of the situation immediately after the minor accident. The basis of the device, which is described by a block diagram, is a mobile phone that is equipped with positioning system, a camera with integrated distance measurement and a digital compass. The description of technological solution is followed by a design of process solution, based on existing legislation and the status of "traffic arbitrator" to determine the culprit of an accident. Final part indicates some economic context of the proposed system and possibilities of its application. The paper illustrates unprecedented advantage of the proposed system for participants of minor accidents, as well as institutions dealing with the liquidation of consequences of such accidents – i.e. primarily for commercial insurances. A model example demonstrates very fast return of investments thanks to the practical avoiding of faked insured events.

Key Words

crash terminal, traffic accidents, information system, communication, insurance, fraud, accident investigation, record of the accident, traffic arbitrator, fault

JEL Classification: A12, K42, L91, L96, O31

Introduction

Once upon a time… On a busy crossroad of a satellite city collide two cars driven by young mothers, which are taking their children to kindergarten. Nobody is visibly injured, cars have just creased fenders. Crashed cars significantly reduce traffic, it forms a long column, drivers honking, children in cars heartrending cry… Both lady drivers call the police. Operations officer – after making sure that no one was injured – advise to solve the matter alone… After urgent pleas of one lady driver, that has two crying children in the car and is obviously in shock, reluctantly promised that the police will come, but due to momentary

possibilities no earlier than in two hours… After fifteen minutes of helplessness and humiliation, the two young women embark on a documentation of the accident. One driver draws up on a piece of paper a kind of declaration that the other driver acknowledges guilt and that the shame on both cars is about 80,000 CZK. The second driver refuses own blame, but her children are continuously crying and thus she ultimately signs her guilty in order to already had a peace from that hell. Both damaged cars leaving…

The second day after the accident informs the insurance company the lady driver who allegedly caused the accident that the total cost of repairing damaged vehicles greatly exceeds the amount of 100 thousand CZK. Due to the fact that the accident was not investigated by the police, insurance company refuses bear the costs of repair under insurance contracts. The third day after the accident one of the children of the car, whose driver wheedled on the second one the conviction, reflects the severe nausea and fainting. Child in spite of a quick transport to a hospital dies. An autopsy shows bleeding in the brain due to strike to the head about three days ago…[2]

This story is a fiction but under current legislation and procedures it is not far away from the situation that could occur… We feel the necessity to reduce danger of similar situations as mentioned above. Following paragraphs suggest possible technical and procedural solution.

1. Current methods of assessing the traffic accidents

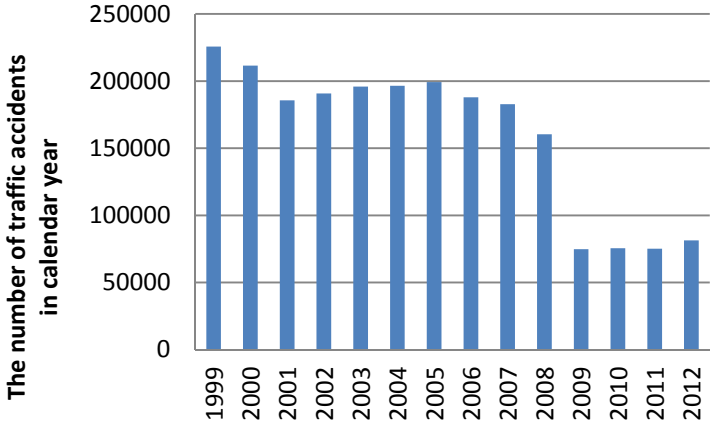
The birth of massive road transport has brought a new negative phenomenon – traffic accidents. In this context arose the social demand for legal form for compensation of damages on vehicle whose driver did not cause the accident, reimbursement of costs associated with the treatment of persons injured in traffic accidents and compensation for damage to property of foreign persons and entities [5]. This situation is solved in most countries in the form of legal compulsory insurance. In the following paragraphs we will deal with the so-called minor accidents, i.e., one that do not result personal injury (although this issue is not simple – see above) or damage to property [6].

Investigation of traffic accidents – especially the degree of their fault – was from the beginning the task of the traffic police. Police – also due to reducing the number of policemen – cannot handle all traffic accidents. The vast majority of accidents – even thanks to the growing of vehicle safety – without injury end with a "mere" creasing plate. Many of these "minor" accidents have a clear culprit, who should be able to ascertain by the participants of an accident themselves [1, 4].

The numbers of vehicles are in recent years constantly increasing. One might therefore expect that inevitably must increase the number of traffic accidents. From Figure 1, it is evident that the beginning of the past decade can be characterized by a relatively stable indicator of the number of traffic accidents. This trend continued until 2008. The most critical year was 2005 with 199,262 accidents. The dramatic decline in the number of traffic accidents is evident between 2008 and 2009. This jump was caused by a change in legislation, which involves the obligation to report the accident to the Police only in cases of

personal injury, death, third party property damage, material damage higher than 100,000 CZK for one vehicle [10]. (Note: In 2000, the limit for the notification of traffic accidents was just 1000 CZK. Since January 2001, a law significantly increased, to 50,000 CZK).

Fig. 1 Development of traffic accidents in the Czech Republic in 1999 – 2012



Source: Informace o nehodovosti na pozemních komunikacích České republiky za rok 2012, [cit. 14.4.2013], accessible from http://www.policie.cz/soubor/2012-12-informace-pdf.aspx; own processing

In other cases it is not necessary to inform the police of the traffic accident. The assessment of the accident cause is determined by the agreement of drivers involved in the accident. Based on these facts can be concluded that accidents have not diminished, but are fewer reported and placed in police statistics [4].

Following a change in legislation, the number of traffic accidents has stabilized at around 75,000 per calendar year. It can be assumed, however, that the curve of accidents still continues in the same trend, with the difference that more than half of traffic accidents are not recorded by the Police. Damage of vehicles involved in an accident must be paid by the insurance company of the culprit of an accident. This gives a space for various insurance frauds. They happen quite often and without an objective investigation of the Police are very difficult to prove. The total amount of insurance fraud proven value increased significantly in 2011 to CZK 838 million that representing an increase of a massive 34 % [11]. The largest number of insurance fraud was traditionally revealed in the vehicle insurance. Insurance companies examined in this field by 47 % of suspected cases more than in previous period.

This form of dealing with traffic accidents may have a number of negative consequences. Any driver after a traffic crash is under stress is not able to objectively assess the situation. He is often driven by his efforts to end the unpleasant situation as quickly as possible – especially if his vehicle is blocking traffic or if he is in the time pressure. There are known cases where some insurance companies challenged the results of driver's agreement and refused to reimburse the costs associated with the repair of the vehicle. The real problems may arise in the case of real or fake health consequences as a result of a traffic accident or during subsequent legal disputes to determine the degree of fault.

In next paragraphs will be described the technology for objective documentation of accident situations.

2. The smart technology – Crash-terminal

Crash-terminal is an electronic device that enables faster, more accurate and more convenient to investigate minor traffic accidents. Manipulating the terminal should not be more complicated than handling electronic equipment such as mobile phone or digital camera [2].

Prerequisite remains certain minimum level of technical competence of car drivers, which nowadays grows together with the ever-expanding range of electronic equipment to facilitate the daily living needs. Individual crash-terminals can be used to capture the state immediately after a traffic accident in the clear defined assumptions when there is no obligation to call the police. Crash-terminals acquire specific information about the location of an accident, including information about the driver and the vehicle.

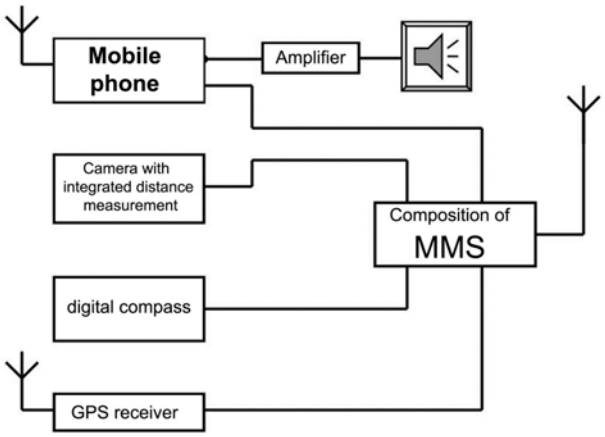
The basis of Crash-terminal is a mobile phone equipped with a digital camera. Other integral parts of the Crash-terminal are positioning system, a distance measuring system and the system for determination of direction of the lens when taking photos. Crash-terminal enables capturing, processing, storing and shipping data, which is based on photos taken from Crash-terminal, and which are supplemented by data of the position of Crash-terminal, data defining the direction of the lens when taking a photo, and data describing the distance of the object that the mobile crash-terminal photographed. The main benefit of the system lies in the acquisition and processing of objective data of the state after a traffic accident, allowing incorporation into the digital data (GIS) corresponding relevant section of roads [9].

In principle, the role of Crash-terminal could after minor modifications of SW fulfill number of powerful smartphones equipped with the Android operating system. Smart Tools (as a free application of e.g. Samsung GT-S5360 Galaxy Y) is able to mediate majority of data necessary for identification of after-accident state. The price of dedicated a special device, however, in the case of mass production could reach a level of CZK 1,000.

Use of the automated system of records and documentation of accident-states via Crash-terminal itself would significantly simplify the settling potential disputes, to ensure the possibility of expert assessment of the degree of fault by traffic accidents by their individual participants and significantly reduce the possibility of insurance frauds. The use of the Crash-terminal would allow significantly alter the situation described in the introductory chapter. The scenario could be as follows: One of the damaged cars drivers is taking out of car storage modified mobile phone – the "Crash-terminal" – which she has received from the insurance company when signing the contract on the lawful insurance. Integrated camera takes pictures of accident – wrecked cars, damaged parts of vehicles. Photos, complemented by geographic coordinates of the location of the accident (i.e. position Crash-terminal when shooting), direction, angle and distance of the subject in the form of MMS are automatically sent to a central dispatching.

There is automatically generated in the GIS map with the accident situation and is stored in the database. MMS is complemented with textual information entered into prepared form, which provides the basic attributes of an accident – driving directions of vehicles, etc.

Fig. 2 Block-scheme of mobile Crash-terminal



Source: own solution

In the case of our lady driver the database stored and archived the documentation of the immediate status after a traffic accident, which may be in the event of a judicial proceeding used as a burden document in terms of identifying the culprit of the accident [9].

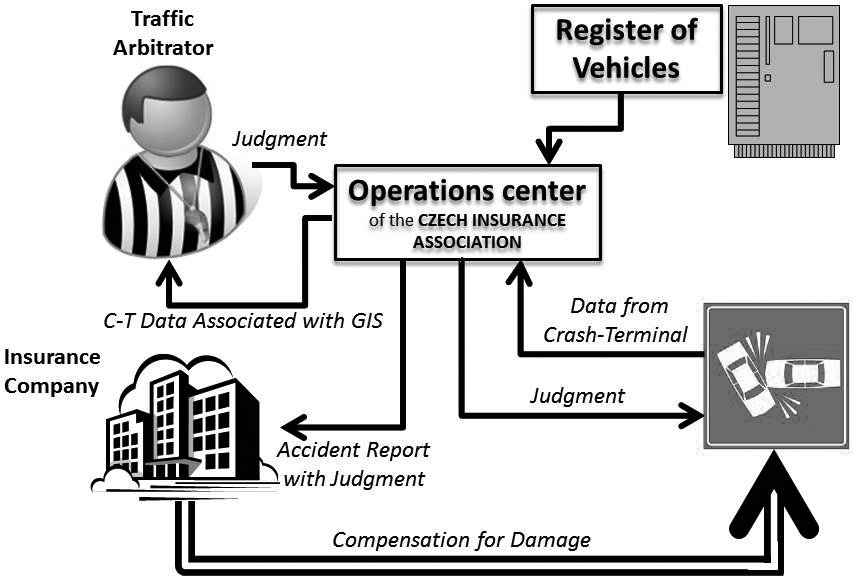
3. The evaluation and decision making process

The proposed technical solution is "only" a significant part of a broader evaluation system for minor accidents – see Fig. 3. On the picture are described individual entities and procedures of decision making process. However, this procedure is based on the legislation in force and can be only applied when no one in an accident is injured and there is no damage to property of others. At the same time, all participants of the accident must estimate that the amount of damage to their vehicle does not exceed 100 000 CZK. In such case any of the parties involved in a traffic accident documents the situation by a Crash-terminal. He makes pictures documenting the location of vehicles after the accident. At the same time takes pictures with corrupted parts of vehicles. Digital data of snapshots are supplemented with geographical coordinates of the accident based on GPS or Galileo positioning system (respectively coordinates of the camera at the time of shooting) and distances between the subject and the camera. It is also necessary to take pictures of license plates that uniquely identify participants of an accident.

Automatically recorded data must be supplemented by identification of drivers (number of driving license or other identity card) and – for some examples – description of a journey (from – to). This information in the MMS format is sent to the operation center. Traffic arbitrator receives the Crash-terminal data complemented with appropriate data from a GIS. Traffic arbitrator is a responsible person certified for assessment of controversial traffic situations. On the basis of an expert assessment of the situation gives his judgment. It is through the Operations Center via SMS delivered to the participants of the accident. The information is currently stored in the operations center and the data packet "Accident Report with Judgment" is send to appropriate insurance company to realize the compensation for damage.

Naturally, it may happen that any of the parties involved in a traffic accident does not agree with judgment of traffic arbitrator. In such case is necessary to call the police, that the situation on the site evaluate and issue a final decision. This decision has a higher legal force than a statement of the traffic arbitrator.

Fig. 3 Procedures of evaluating process



Source: own solution

The proposed system in this way complements the Czech legislation on the status of traffic arbitrators. Currently some insurance companies in the Czech Republic unlawfully assessed the degree of culpability of traffic accidents. By law, they have the right to assess the extent of damage only, not the degree of responsibility. It falls exclusively within the competence of the police and judiciary. The establishment of the statute of the traffic arbitrator could insurance companies part of these competencies appropriated. Insertion of a clause arbitrator in insurance contracts can establish that in traffic accident participants are required to cooperate with the operating center [1, 5, 10]. The great advantage of new system is, that in the case of legal disputes is available unquestionable documentation of the accident.

4. The economic assessment of proposed procedure

Although perhaps the most important attribute of the system is to improve legal certainty and confidence in the fair dispute resolution resting on professional expertises, important argument is well taken legally relevant documents from accident site to avoid even at any subsequent disputes to lack of items of evidence (see potential situations in the introductory chapter). Within the design of the new system were also solved through economic models some financial issues associated with its implementation. The work on different models is currently in progress. Therefore, here are suggested only some applied starting points. Total system expenditure can be divided into two main parts: 1) costs associated with acquisition of crash-terminals, 2) the cost of setting up and services of the operations center, including remuneration of the traffic arbitrators.

In terms of implementation can be take into consideration two variants – a) disposable large-scale deployment of terminals in all motor vehicles; b) gradual introduction of terminals in new vehicles. The cost of dedicated terminals is estimate between 500 – 1000 CZK. In 2012 the Czech Republic had registered 6,463,232 motor vehicles with an average vehicle age 16 years. It is clear that the waiting for the gradual acquisition of new vehicles equipped with crash-terminals is due to time reasons unacceptable. Price of CZK 6 billion looks menacing, but at least in the initial phase is not necessary to equipped with terminals motorcycles and tractors (about 1.1 million of vehicles). Acquisition of terminals may be once included in the cost of mandatory insurance.

The entire system must be financially independent. The most important item of operating expenses are costs of professional expertise. In 2012, it was resolved approximately 380,000 claims relating to traffic accidents. In the police statistics were recorded about 80,000 traffic accidents, i.e. insurance events investigated by the police of the Czech Republic. Starting from these data we can consider approximately 300,000 accidents that should be solved by traffic arbitrators. If we estimate the average time for an expertise to 10 minutes, we can quantify the minimum annual man-hours of expert services to 50,000 (300 000 : 6). When considering annual working capacity of an expert to 1500 hours, we need for this activity at least 34 operators (traffic experts). In order to have a sufficient reserve with respect to the uneven distribution of accidents over time, count model with the need to double the number of experts (ie 70). Assuming the monthly payroll costs of an expert to about 35 thousand CZK, annual labor costs of experts is less than CZK 30 million. Should it become necessary to deal with about one third insurance events by external experts and one expert price would amount to CZK 300, the cost of external expertise should also reached CZK 30 million. With a large reserve can be estimated operating cost of the system ((including operating costs of ICT) to 70 million CZK. If the service price of traffic expert would be established for the culprit of the accident on the 500 CZK (which is considerably much less than the penalty for an accident investigation by traffic police), estimated income is approx. 75 million CZK, i.e. higher than the operating costs of the system.

Conclusion

The proposed system will also significantly reduce insurance fraud. Based on model estimates of 2.5 % savings due never realized insurance frauds, benefits of the system for insurance companies would be annually around CZK 0.3 billion [13]. In the near future we are going to elaborate financial aspects of the proposed system in details.

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Assessment of EU12 Countries' Efficiency Using Malmquist Productivity Index

Abstract

The paper deals with an application of Data Envelopment Analysis (DEA) method in an efficiency analysis of the "new" European Union (EU) Member States (EU12) during reference period 2000 – 2011, resp. in years of growth period 2000-2007 and in years of crisis and post-crisis period 2008-2011. DEA method becomes a suitable tool for setting an effective/ineffective position of each country, because measures numerical grades of efficiency of economical processes within evaluated countries. When applying DEA method, indicators of the Country Competitiveness Index (CCI) are used. Indicators included in CCI are interrelated; therefore correlation is used for assessment of internal relations between indicators and for reduction of their high number to a smaller number of variables, but at a minimum loss of information contained in the original variables. The main aim of the paper is to measure efficiency changes over the references periods and to analyse a level of productivity in individual countries based on the Malmquist Productivity Index, and then to classify EU12 countries according to efficiency results. The theoretical part of the paper is devoted to the fundamental basis of efficiency theory and DEA method – especially the Malmquist Productivity Index. The empirical part is aimed at measuring the degree of productivity and level of efficiency changes of evaluated countries by the Malmquist Productivity Index, measuring the change of technical efficiency and the movement of the production possibility frontier in reference period. The final part of the paper offers a comprehensive comparison of results obtained by calculating the Malmquist Productivity Index.

Key Words

CCI index, competitiveness, correlation, DEA method, efficiency, EU12 countries, Malmquist index

JEL Classification: C67, C82, O11, O33, Y10

Introduction

In the European Union (EU), the process of achieving an increasing trend of performance and a higher level of competitiveness is significantly difficult by the heterogeneity of countries and regions in many areas. Although the EU is one of the most developed parts of the world with high living standards, there exist significant and huge economic, social and territorial disparities having a negative impact on the balanced development across EU Member States and their regions, and thus weaken EU's performance and competitiveness in a global context and in a globalized economy. The European integration process is thus guided by striving for two different objectives: *to foster economic competitiveness* and *to reduce differences* [4]. The support of cohesion and balanced development together with

increasing level of competitiveness belong to the temporary EU's *key development objectives*. In relation to competitiveness, performance and efficiency are *complementary objectives*, which determine the long-term development of countries in a globalized economy.

Globalization, rapid technological changes, an ageing population and new knowledge economies are external factors which are becoming a growing threat. The EU needs to transform its economy and society. Europe's economic challenge is to secure its position in global markets facing intense challenges from its competitors. The EU makes an effort to restore the foundations of its competitiveness through increasing its growth potential and its productivity. Due to global competitive conditions and economic crisis, significant changes in economic processing play an increasingly important role in maintaining a competitive position across individual countries. Based on the theory of Data Envelopment Analysis (DEA), DEA approach represents a convenient way to analyse the efficiency of countries, and the order of them taking into account their level of efficiency.

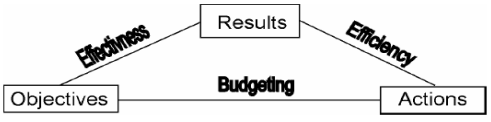
1. Theoretical Background of Efficiency Analysis

In recent years, the topics about assessment of efficiency have enjoyed economic interest. Although there is no *uniform definition* and understanding of this term*, no mainstream approach* for measuring of efficiency, this multidimensional concept remains one of the basic standards of performance evaluation (besides the concepts of competitiveness and productivity) and it is also seen as a reflection of success of area in a wider comparison. Increasing efficiency is generally considered to be the only one sustainable way of improving living standards in the long-term period; see e.g. [6].

1.1 Definition of Efficiency and Effectiveness

Performance management is one of the major sources of sustainable national efficiency and effectiveness (Fig. 1). A systematic understanding of the factors that affect productivity, and subsequently also competitiveness, is very important. Performance is also highly important for many economic subjects as a whole and for the individuals involving in it. Performance comprises both a behavioural and an outcome aspect. It is a multidimensional concept as well as competitiveness.

Fig. 1 The triangle of the performance

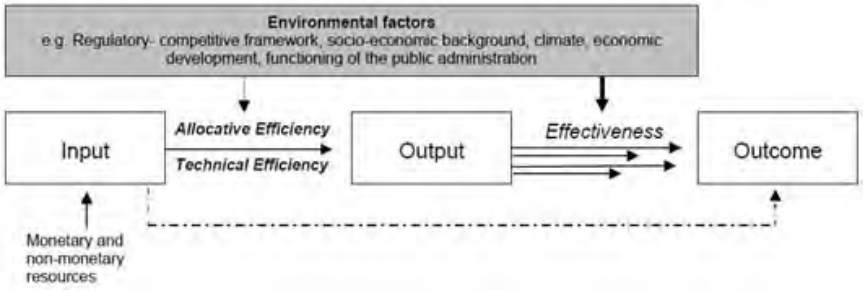


Source: [5, p. 8]

Efficiency and effectiveness analysis is based on the *relationship between the inputs* (entries), *the outputs* (results) and *the outcomes* (effects). The *efficiency* can be achieved under the conditions of maximizing the results of an action in relation to the resources used, and it is calculated by comparing the effects obtained in their efforts. As it can be seen in Fig. 2, the *efficiency is given by the ratio of inputs to outputs*, but there is

difference between *the technical efficiency* and *the allocative efficiency* [5]. The technical efficiency implies a relation between inputs and outputs on the frontier production curve, but not any form of technical efficiency makes sense in economic terms, and this deficiency is captured through the allocative efficiency that requires a cost/benefit ratio. The *effectiveness implies a relationship between outputs and outcomes*.

Fig. 2 The relationship between the efficiency and the effectiveness



Source: [5], p. 3

1.2 Approaches to Efficiency Evaluation

Techniques to measure efficiency are improved and investigations of efficiency become more frequent. Measurement of efficiency of countries and regions, resp. their factors, *remains a conceptual challenge*, because there are *difficulties in efficiency measuring*. Measurement of efficiency is highly sensitive to the data sets being used. Good quality data are needed because the techniques available to measure efficiency are sensitive to outliers and may be influenced by exogenous factors. *Data used for international comparisons* require a minimum level of homogeneity. In the early research studies focused on separate measures for productivity, there was a failure to combine the measurements of multiple inputs into any satisfactory measure of efficiency. These inadequate approaches included forming an average productivity for a single input (ignoring all other inputs), and constructing an efficiency index in which a weighted average of inputs is compared with output. Responding to these inadequacies of separate indices of labor productivity, capital productivity, etc., Farrell [2] proposed an activity analysis approach that could more adequately deal with the problem. Farrell confined his numerical examples and discussion to single output situations, although he was able to formulate a multiple output case. Twenty years after Farrell's model, and building on those ideas, *A. Charnes, W. W. Cooper* and *E. Rhodes* in 1978 [2], responding to the need for satisfactory procedures to assess the relative efficiencies of multi-input/multi-output production units, introduced a powerful methodology – *Data Envelopment Analysis* (DEA) in the form of CCR model with constant returns to scale (CRS).

Measurement and evaluation of efficiency is an important issue for at least *two reasons*. One is that in a group of units where only limited number of candidates can be selected, the efficiency of each must be evaluated in a fair and consistent manner. The other is that as time progresses, better efficiency is expected. Hence, the units with declining efficiency must be identified in order to make the necessary improvements [7]. The

efficiency of countries can be evaluated in either a cross-sectional or a time-series manner, and the *DEA is useful method for both types of efficiency evaluation* [6].

2. Empirical Analysis of Efficiency of EU12 Countries

2.1 Methodological Background of the Empirical Analysis

If we want to evaluate the degree of efficiency or search for sources of efficiency, it is appropriate to use the formulation of DEA model. DEA is a relatively new "data oriented" approach for providing a relative efficiency assessment and evaluating the efficiency of a set of peer entities called *Decision Making Units* (DMUs) which convert multiple inputs into multiple outputs. DEA is thus a multi-criteria decision making method for evaluating effectiveness, efficiency and productivity of a homogenous group (DMUs). The aim of DEA method is to examine DMU if they are effective or not effective by the size and quantity of consumed resources by the produced outputs. DEA can successfully separate DMUs into categories which called efficient DMUs, high and slight efficient and inefficient DMUs [2]. Efficient DMUs have equivalent efficiency score. However, they don't have necessarily the same performance. DMU is efficient if the observed data correspond to testing whether the DMU is on the imaginary *'production possibility frontier'*. All other DMU are simply inefficient, and DEA identifies a set of corresponding efficient units that can be utilized as benchmarks for improvement of inefficient units. Efficiency score of DMUs is defined as follows (1):

$$Efficiency\ of\ \ DMU = \frac{\text{weighted sum of outputs}}{\text{weighted sum of inputs}}. \tag{1}$$

2.2 Data Base Characteristics for Efficiency Analysis

The efficiency analysis, based on application of DEA approach, is used for evaluating national development quality and potential (with respect to the national factors endowment). Based on the above facts, it is possible to determine the initial hypothesis of the analysis, which is based on the assumption that more advanced Central European countries achieving best results in efficiency (especially Visegrad countries and Slovenia) are countries best at converting inputs into outputs and therefore having greater performance and productive potential than Balkan countries and Baltic countries. Database of indicators is part of a common approach of WEF and EU in the form of Country Competitiveness Index (CCI). Eleven pillars of CCI are grouped according to the different dimensions (input versus output aspects) of national competitiveness they describe. The terms 'inputs' and 'outputs' are meant to classify pillars into those which describe driving forces of competitiveness, also in terms of long-term potentiality, and those which are direct or indirect outcomes of a competitive society and economy. Methodology of CCI is suitable for measuring national competitiveness by DEA method [3]. Set of CCI data file consists of 66 CCI indicators – 38 of them are inputs and 28 outputs. Indicators selected for the CCI framework are all of

quantitative type (hard data) and the preferred source has been *the European Statistical Office*. Whenever information has been unavailable or inappropriate at the required territorial level, other data sources have been explored such as the *World Bank*, *Euro barometer*, *Organization for Economic Co-operation and Development* and *European Cluster Observatory*. In this paper, all CCI indicators are not used because all indicators were not available for the whole period for each country, but for some indicators were found comparable indicators. The pillars and 62 used indicators are listed in Appendix 1. Empirical analysis is based on a frontier non-parametric approach and aims to study productivity growth and performance effectiveness. This is based on Malmquist index (MI) for measuring the change of technical efficiency and the movement of the frontier in terms of individual countries, in during reference period 2000 – 2011, in years of growth period 2000 – 2007, and in years of crisis and post-crisis period 2008 – 2011.

Suppose we have a production function in time period *t* as well as period *t+1*. MI calculation requires two single period and two mixed period measures. The two single period measures can be obtained by using the *CCR model with Constant Returns to Scale* (CRS). For simplicity of the Malmquist index calculation, it is presented basic DEA models based on assumption of a single input and output. Suppose each DMU_j *(j=1, 2... n)* produces a vector of output $y_j^t = \left(y_{1j}^t, \ldots, y_{sj}^t\right)$ by using a vector of inputs $x_j^t = \left(x_{1j}^t, \ldots, x_{mj}^t\right)$ at each time period *t, t=1... T*. From time *t* to time *t+1*, DMU_0's efficiency may change or (and) the frontier may shift. MI is calculated via (2) comparing x_0^t to the frontier at time *t*, i.e., calculating $\theta_0^t\left(x_0^t, y_0^t\right)$ in the following input-oriented CCR CRS model (2):

$$\theta_0^t\left(x_0^t, y_0^t\right) = \min \theta_0, \tag{2}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^t \le \theta_0 x_0^t,\ \sum_{j=1}^{n} \lambda_j y_j^t \ge y_0^t,\ \lambda_j \ge 0,\ j = 1, \ldots, n,$$

where $x_0^t = \left(x_{10}^t, \ldots, x_{m0}^t\right)$ and $y_0^t = \left(y_{10}^t, \ldots, y_{s0}^t\right)$ are input and output vectors of DMU_0 among others; λ represent vector of weights assigned to individual units, resp. *DMUs*.

MI is further calculated via (3) comparing x_0^{t+1} to the frontier at time *t+1*, i.e., calculating $\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)$ in the following input-oriented CCR CRS model (3) for $\lambda_j \ge 0,\ j = 1, \ldots, n$:

$$\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right) = \min \theta_0, \tag{3}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^{t+1} \le \theta_0 x_0^{t+1},\ \sum_{j=1}^{n} \lambda_j y_j^{t+1} \ge y_0^{t+1}.$$

MI is further calculated via (4) comparing x_0^t to the frontier at time *t+1*, i.e., calculating $\theta_0^{t+1}\left(x_0^t, y_0^t\right)$ via the following linear program (4) for $\lambda_j \ge 0,\ j = 1, \ldots, n$:

$$\theta_0^{t+1}\left(x_0^t, y_0^t\right) = \min \theta_0, \tag{4}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^{t+1} \le \theta_0 x_0^t, \ \sum_{j=1}^{n} \lambda_j x_j^{t+1} \ge y_0^{t+1}.$$

MI is further calculated via (5) comparing x_0^{t+1} to the frontier at time *t,* i.e., calculating $\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right)$ via the following linear program (5) for $\lambda_j \ge 0,\ j = 1, \ldots, n$:

$$\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right) = \min \theta_0, \tag{5}$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_j^{t} \le \theta_0 x_0^{t+1}, \ \sum_{j=1}^{n} \lambda_j x_j^{t} \ge y_0^{t+1}.$$

MI measuring the efficiency change of production units between successive periods *t* and *t+1*, is formulated via (6):

$$M_0\left(x^{t+1}, y^{t+1}, x^t, y^t\right) = E_0 \cdot P_0, \tag{6}$$

where E_0 is change in the relative efficiency of DMU_0 in relation to other units (i.e. due to the production possibility frontier) between time periods *t* and *t+1; P_0* describes the change in the production possibility frontier as a result of the technology development between time periods *t* and *t+1*. The following modification of M_0 (7) makes it possible to measure the change of technical efficiency and the movement of the frontier in terms of a specific DMU_0,

$$M_0 = \frac{\theta_0^t\left(x_0^t, y_0^t\right)}{\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)} \left[\frac{\theta_0^{t+1}\left(x_0^{t+1}, y_0^{t+1}\right)}{\theta_0^t\left(x_0^{t+1}, y_0^{t+1}\right)} \cdot \frac{\theta_0^{t+1}\left(x_0^t, y_0^t\right)}{\theta_0^t\left(x_0^t, y_0^t\right)} \right]^{1/2}. \tag{7}$$

The first component E_0 measures the magnitude of *technical efficiency change* (TEC) between time periods *t* and *t+1*. Obviously, $E_0 <\ =\ > 1$ indicating that technical efficiency improves remains or declines. The second terms P_0 measures the shift in the possibility frontier, i.e. *technology frontier shift* (FS), between time periods *t* and *t* + 1. Productivity declines if $P_0 > 1$, remains unchanged if $P_0 = 1$ and improves if $P_0 < 1$. In Tab. 1, characteristics and trends of MI are shown.

Tab. 1 Characteristics and trends of Malmquist index

Malmquist Index	Productivity	Efficiency Change	Technical Efficiency
MI > 1	Declining ↓	Change < 1 Improving	Change < 1 Improving
MI = 1	Unchanging —	Change = 1 Unchanging	Change = 1 Unchanging
MI < 1	Improving ↑	Change > 1 Declining	Change > 1 Declining

Source: Own elaboration

For solution of DEA method software tools based on solving linear programming problems are used in the paper, e.g. Solver in MS Excel 2010, such as *the DEA Frontier*.

3. The Results of Efficiency Analysis and Discussion

The *initial hypothesis* was *partly confirmed* through analysis by *Malmquist index*, as it is illustrated in following evaluation. Most of evaluated countries have recorded both increasing and decreasing trend in efficiency development during reference years of period 2000 – 2011, but in years 2007 – 2008, most of countries have recognized considerable deterioration in efficiency (due to economic crisis). It is recognized gradually improving in economic development, but it is still very slow. Apparently the best results are traditionally achieved by economically powerful countries (in the group of countries which are new EU Member States) which were '*highly efficient*' during the reference period. In Tab. 2, results of *'efficient' countries* are recorded and also development´ trend in efficiency of individual countries in the context of their effective/ineffective position based on efficiency results is recorded. Best results (of all evaluated countries and in all reference years) have recognized *Slovenia*, which is coloured by grey colour in Tab. 2. This country has recorded clear increasing trend and best levels of MI.

Tab. 2 Application of MI for EU 12 countries

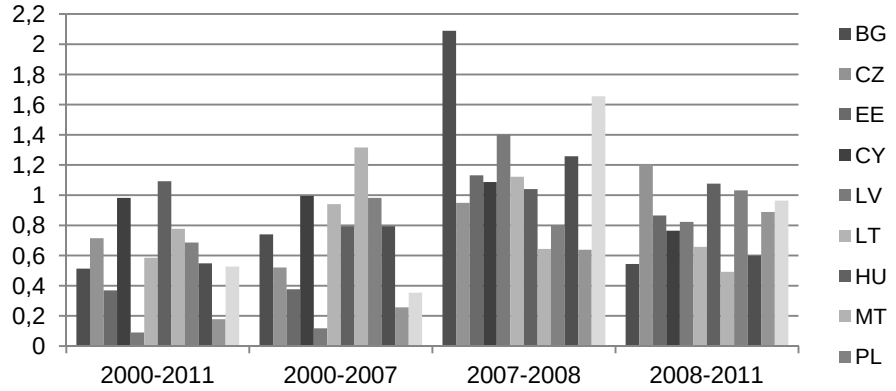
Code		Country/Time	IO CCR CRS MI*							
			2000 – 2011		2000 – 2007		2007 – 2008		2008 – 2011	
1	BG	Bulgaria	0.5132	↑	0.7399	↑	2.0892	↓	0.5445	↑
2	**CZ**	**Czech Republic**	**0.7153**	**↑**	**0.5209**	**↑**	**0.9491**	**↑**	**1.2040**	**↓**
3	EE	*Estonia*	0.3686	↑	0.3766	↑	1.1319	↓	0.8657	↑
4	CY	*Cyprus*	0.9824	↑	0.9951	↑	1.0867	↓	0.7649	↑
5	LV	Latvia	0.0900	↑	0.1173	↑	1.4020	↓	0.8230	↑
6	LT	*Lithuania*	0.5852	↑	0.9411	↑	1.1225	↓	0.6575	↑
7	*HU*	*Hungary*	*1.0923*	*↓*	*0.7939*	*↑*	*1.0404*	*↓*	*1.0759*	*↓*
8	**MT**	**Malta**	**0.7770**	**↑**	**1.3164**	**↓**	**0.6434**	**↑**	**0.4926**	**↑**
9	**PL**	**Poland**	**0.6860**	**↑**	**0.9818**	**↑**	**0.8015**	**↑**	**1.0318**	**↓**
10	RO	Romania	0.5486	↑	0.7947	↑	1.2572	↓	0.5991	↑
11	**SI**	**Slovenia**	**0.1787**	**↑**	**0.2569**	**↑**	**0.6388**	**↑**	**0.8884**	**↑**
12	**SK**	**Slovakia**	**0.5276**	**↑**	**0.3545**	**↑**	**1.6554**	**↓**	**0.9637**	**↑**

Source: Own calculation and elaboration

Except Slovenia, other countries have recognized very prosperous results in efficiency scores. These countries are mostly countries of Visegrad Four Group, thus *Czech Republic, Slovakia* and *Poland*, then also *Malta*; in the reference period 2000 – 2011 (these countries are highlighted by bold format in Tab. 2). These countries belong to countries which have recorded best results in efficiency during all references years 2000 – 2007, 2007 – 2008, 2008 – 2011 and 2000 – 2011. These countries have recognized best results across reference periods according to the results of technical and technological efficiency changes; they have recorded previously increasing trend and only in one reference period have recorded decreasing trend. In the frame of paper hypothesis, these could be *countries with the best competitive potential and perspective to*

further development, as it is also illustrated in Figure 1 in MI development trends for evaluated countries in individual reference periods.

Fig. 1 Trends of MI in individual countries in selected reference periods



Source: Own calculation and elaboration

Group of efficient countries is followed by a group of countries which are also *'highly efficient'*. These countries do not achieved best results in efficiency' scores and trends, but their efficiency indices reached consistently fairly values during the reference years. These countries are *Estonia, Cyprus*, and *Lithuania*. Their efficiency results, and especially efficiency trend across reference years in selected periods, were poorer and were less satisfactory (as it is shown in Figure 1). All these countries also belong to less powerful new EU Member States and have recorded decreasing trend in their efficiency, and also deteriorating in technical and technological efficiency changes. These countries are highlighted by italics in Tab. 2.

Countries with the worst levels of efficiency' scores and trends are classified as *'slightly efficient' countries*, i.e. these countries are considered as countries with lower competitive potential. From the group of new EU Member States (EU12) belongs to the group of slightly efficient countries with lower competitive position and potential, *Bulgaria, Romania* and *Hungary*. In Tab. 2, the most 'inefficient' country is highlighted by light grey colour and italics; this country is *Hungary* with the lowest development potential; its trends show decreasing level of convergence to other EU12 countries.

Conclusion

Based on DEA approach has been found out that in evaluated countries is a *distinct gap between economic and social standards*, so differences still remain. Measuring the Malmquist index on the basis of DEA is an important method which has many applications. This index has been used in this paper to analyse and evaluate performance of EU12 countries across selected years of reference period 2000 – 2011. Regarding the findings and the analysis of each country can decide whether it had a efficiency increase during the time period, or not. By having this information and dividing productivity into its elements, the basic trend in performance whether it be increase or decrease is observed. According to MI results, in EU12 countries noticeable

productivity decreases were mostly achieved; more or less balanced performance and efficiency trend were recognized during reference years. Most countries experienced decline in their performance as a result of economic crisis. The economic crisis has threatened the achievement of sustainable development in the field of competitiveness. The crisis has underscored importance of competitiveness-supporting economic environment to enable economies better absorb shocks and ensure solid economic performance going in future.

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Appendix

Tab. 1 Indicators of inputs and outputs in years 2000 – 2007 – 2008 – 2011 relevant to DEA

Dimension	Pillar	Indicator of input or output*
Inputs	Institution	Political Stability, Voice and Accountability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption
	Macroeconomic Stability	Harmonized Index of Consumer Prices, Gross Fixed Capital Formation; Income, Saving and Net Lending/Net Borrowing, Total Intramural Research & Development Expenditure, Labour Productivity per Person Employed; ~~General Government Gross Debt~~
	Infrastructure	Railway transport – Length of Tracks, Air Transport of Passengers, Volume of Passenger Transport, Volume of Freight Transport; Motorway Transport – Length of Motorways, Air Transport of Freight
	Health	Healthy Life Expectancy, Infant Mortality Rate, Cancer Disease Death Rate, Heart Disease Death Rate, Suicide Death Rate; Hospital Beds, Road Fatalities
	Primary, Secondary and Tertiary Education; Training and Lifelong Learning	Mathematics-Science-Technology Enrolments and Graduates, Pupils to Teachers Ratio, Financial Aid to Students, Total Public Expenditure at Primary Level of Education, Total Public Expenditure at Secondary Level of Education, Total Public Expenditure at Tertiary Level of Education, Participants in Early Education, Participation in Higher Education, Early Leavers from Education and Training, Accessibility to Universities; Lifelong Learning
	Indicators for Technological Readiness	Level of Internet Access; E-government Availability
Outputs	Labour Market Efficiency	Labour productivity, Male employment, Female employment, Male unemployment, Female unemployment, Public expenditure on Labour Market Policies; Employment rate, Long-term unemployment, Unemployment rate
	Market Size	Gross Domestic Product; Compensation of employees, Disposable income
	Business Sophistication	Gross Value Added in sophisticated sectors, Employment in sophisticated sectors, ~~Venture capital (investments early stage), Venture capital (expansion-replacement)~~
	Innovation	Human resources in Science and Technology, Total patent applications, Employment in technology and knowledge-intensive sectors, Employment in technology and knowledge-intensive sectors-by gender, Employment in technology and knowledge-intensive sectors-by type of occupation, Human resources in Science and Technology – Core, Patent applications to the EPO, Total intramural R&D expenditure, High-tech patent applications to the EPO, ICT patent applications to the EPO, Biotechnology patent applications to the EPO; ~~Employment in technology and knowledge-intensive sectors-by level of education~~

Note: * Number of indicators for inputs was decreased from 38 to 37; Number of indicators for outputs was decreased from 28 to 25

Source: [1]; own elaboration

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Is There a Space for an Innovative Approach to Sources of Business Financing in the Czech Republic?

Abstract

Innovation is supposed to be something new, original, or improved that generates value. No matter if it is a product, service, or a process, it can be just innovative thinking. Innovative thinking may help businesses to increase profit, together with efficiency, quality, or human experience. Innovation may be radical or gradual, and can happen in any department of an enterprise. The aim of this paper is to find a possible space for innovative approach to sources of business financing in the Czech Republic. Could the use of innovative source of financing bring additional profit for the company? Would be the innovative approach to the corporate capital structure more profitable? The article analyses selected sources of financing from the two perspectives: first perspective is the examination of various sources of financing as of products suitable for innovation, and the second perspective includes exploring of possible changes in the corporate capital structure with increased or a reduced utilization of the particular source of financing, which would represent an innovative approach of companies to financing. The article focuses on selected traditional (bank loans and borrowings, leasing) and innovative sources of financing (share and bond issues, factoring, export financing). Findings of this paper indicate substantial potential for innovations of capital structure of Czech companies, which rely primarily on own sources of financing (owner's equity, profit and reserve funds), and among external sources prevail bank loans and other long-term liabilities. An increased use of the capital markets for financing, while it is more expensive for companies, may bring significant benefits for the companies and the whole economy as well in the long term.

Key Words

sources of financing, innovation, capital structure, business, debt, equity

JEL Classification: G32

Introduction

"There is no God-given, correct debt ratio, and if there were, it would change. It may be that the recent wave of financial innovation, by giving firms easier access to financial markets and the ability to hedge operating risks, has made higher debt ratios possible without increasing the risks or costs of financial distress". [1] According to Brealey and Myers, there are two main reasons for financial innovation. The first cause is taxes and government regulation which have an effect of subsidized innovation. On the other hand, many traditional financial instruments still remain unchanged even though the regulation and tax effects are negative. The second reason for innovation was to widen investors' and firms' choice. Many new investment and financial products arose recently in connection with changes of economic conditions – the fluctuations in exchange and interest rates have

increased range of innovated products hedging both firms and investors against such risks. Here it should be recalled another reason for the recent rapid development of innovative financial products – the massive development of telecommunication and computer technologies allowed price reduction of financial products and their worldwide expansion. Debt and equity are the two major sources of financing with debt holders and shareholders representing the two types of financial investors in the firm. Each of these is associated with different levels of risk, benefits, and control. While debt holders exert lower control, they often earn a fixed rate of return and are protected by contractual obligations with respect to their investment. Shareholders are the residual claimants who bear most of the risk and correspondingly have greater control over decisions. [2]

This paper includes results of analysis of capital structure based on empirical research. Corporate financial data were obtained from the commercial database Albertina for companies from six business sectors (according to the classification CZ-NACE). Economic results of 100 companies with the highest turnover were investigated within each business sector.

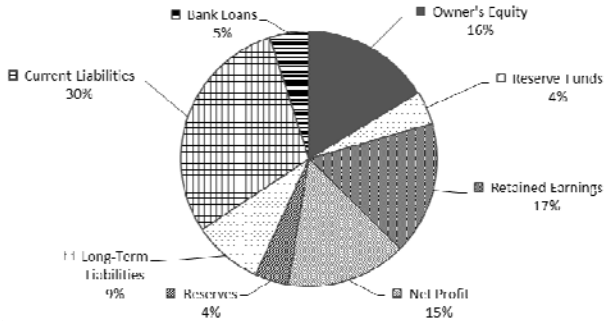
1. An overview of corporate financing principles in the Czech Republic

The Czech Republic is ranked among the bank oriented economies which means that companies get additional capital primarily from banks. There are historical reasons, reasons based on the legal system, and also small willingness of companies to go public.

According to Nobes and Parker (2010) [3], there are significant differences between corporate financing in the continental Europe and in Anglo-Saxon countries. The reason for this is the method of raising capital. While in the continental Europe there are many small family enterprises which get additional capital primarily from banks, in the United Kingdom and also in the United States there is a large number of private shareholders who have invested their funds in company's shares via the capital market. The legal systems of countries also contribute to the method how these two groups of countries get capital. Provided that the economy relies primarily on the conversion of savings into investments performed by banks, then the performance of the economy and the dynamics of economic development is slower. [4] According to the estimation of IMF, reduction in stock market capitalization by 10 per cent can cause decline in GDP up to 0.8 to 3 per cent. [5]

According to the pecking order theory companies first use for financing internal resources, especially retained earnings, then the external debt, and as a last resort external equity. [6] Figure 1 shows an average capital structure of selected stock companies which in 2010 ranked in the TOP 100 EVA Ranking (EVA is an estimate of a firm's economic profit); the data were available for 35 companies. The preference order of internal finance, debt, and equity is not evident in this sample. Long term liabilities, current liabilities and bank loans (in sum total liabilities) are prevailing sources of financing in most of the selected companies.

Fig. 1 Average capital structure of stock companies ranked in the TOP 100 EVA Ranking in 2010



Source: own investigation

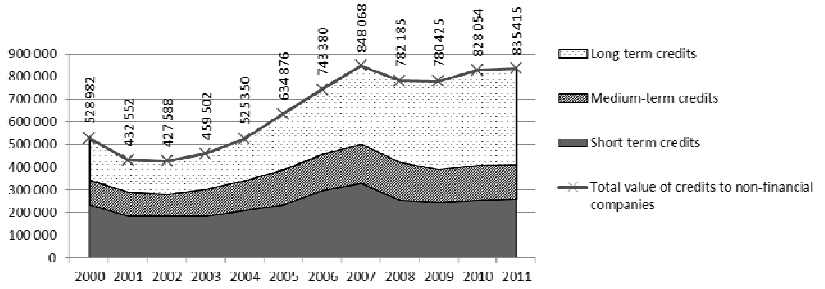
2. Traditional and innovative sources of financing

The average capital structure obtained by using the balance sheet, however, does not represent the full spectrum of possible sources of financing used in the Czech Republic (CR). Prevailing own sources of financing are owner's investment (in form of start-up or additional capital) and retained profit. The traditional sources of external financing represent bank loans, borrowings, and leasing, which are commonly used even by companies with low financial knowledge. Of course, there are also more sophisticated and innovated sources of financing, which may require more effort from companies and investors (issues of securities, factoring, export financing, foreign investments are mentioned in this article).

2.1 Bank loans and borrowings

Bank loans, as money borrowed at an agreed rate of interest over a set period of time, represent an important source of short-term and long-term financing for businesses. Firms take advantage of set repayments which are spread over a period of time, which is good for budgeting. Disadvantages are represented by high cost of this source of financing (interest payments) and required security on the loan by banks. Bank debt consists of two main categories: revolving bank debt, which includes committed revolving-credit facilities or lines of credit; and term bank debt, which includes term loans, bank overdrafts, and borrowings on uncommitted lines of credit. [7]

Fig. 2 Volume of credits to non-financial companies in the CR (in millions CZK)



Source: own elaboration, based on [8]

The total volume of provided bank loans has grown steadily since 2001, except slight decline caused by the global financial crisis. According to the figure 2, the long-term credits prevail in the total amount of provided loans, and their proportion is still increasing.

Table 1 shows that bank loans have represented substantial part of corporate capital structure of the investigated Czech companies; the ratio has remained broadly stable within the whole monitored period.

Tab. 1 Bank loans in % of total assets

Year	1998	2000	2002	2004	2006	2008	2010
Bank loans/ Total assets ratio in % (average)	17.34	18.18	14.29	16.40	17.43	18.73	15.31

Source: own investigation

Table 1 indicates that the investigated Czech companies weren't much innovative in their approach to the capital structure in the use of bank loans. On the other hand, there is a continuous process of innovation of banking credit products which aims to increase the demand for these products. Most of these changes have just a marketing nature, because the portfolio of credit products on the Czech market is so extensive, that to make a fundamental product innovation is not easy to perform. Nevertheless, the prospects of banking loans in case of capital structure innovation can be expected to be rather against their use, and a transition to other sources of financing could occur.

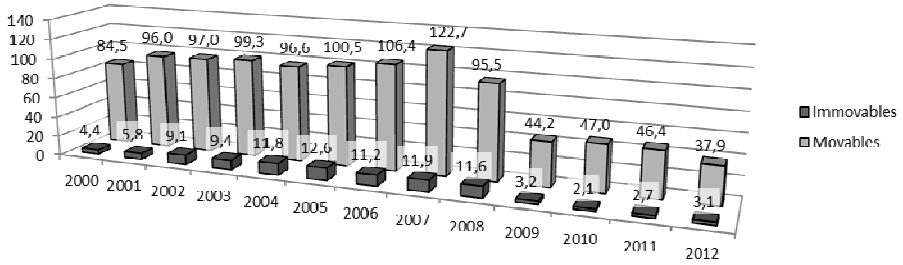
2.2 Leasing

Since the fifties in the twentieth century, leasing has represented one of the basic forms of enterprise fixed assets acquisition, using debt sources. It is a specific way of financing that represents a temporary form of a fixed asset rental by its owner – the leasing company (a lessor) to a user (a lessee) for an agreed rent (leasing installment). In practice, the most frequently applied forms of leasing are the operating and financial leasing. [9]

In the Czech Republic, the first leasing contracts were concluded already before 1989. At the beginning of the nineties of the twentieth century, leasing financing increased considerably. Initially, the financial leasing prevailed over the operating leasing, however the ratio has gradually changed. In 1991, the operating leasing represented approx. 12 % of the total volume of leasing transactions in the Czech leasing market, whereas in 2010 it was 25.8 %, in 2011 33 %, and in 2012 even 43.5 %. [10]

As obvious from the information above, since 2009 the economy of the Czech Republic has been in the recession phase, associated with the GDP decrease, a reduction in industrial production, an increase in the unemployment and inflation rates. This situation has resulted in general stagnation of corporate investments, as well as in the decrease of household spending. In 2012, the members of the Czech Leasing and Financial Association provided to enterprises and individual consumers via leasing, factoring or credits the total amount of 118.2 billion Czech crowns, which is by 6.1 CZK less compared to 2011.

Fig. 3 Development of leasing transactions in the CR (in billions CZK)



Source: Czech Leasing and Financial Association [10]

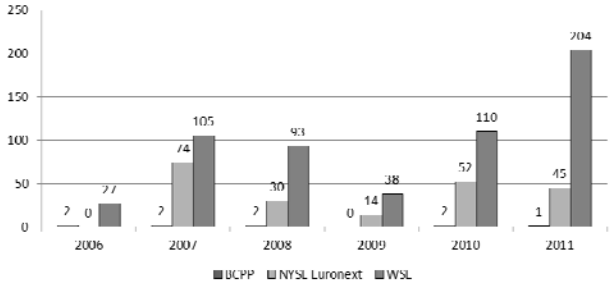
Nowadays, a responsible approach towards environmental protection is expected from the enterprises. The aim of the measures adopted by some companies is to reduce the negative footprint and impact of their activities on the environment. [11] At the same time many of them must face the lack of financial sources that are necessary for the implementation of environmental activities. In that case, the financing via leasing seems to be the one of suitable options. From that point of view, there can be expected a considerable extension and innovation in the leasing products in the forthcoming years.

2.3 Share issues in the Czech Republic

Owner's equity represents "the amount that stockholders paid to the company when they bought shares the company sold to raise capital in case of joint stock companies" [12], or the sum of deposited amounts of copartners in case of a limited liability company. Only a joint stock company can get additional capital by issuing shares on the capital market. Share issues represent a long-term source of finance. Among advantages of share issue belongs the fact that share doesn't have to be repaid, and the dividends are paid only if a company has a profit. The disadvantage of using shares as a source of financing is that profits will be paid out as dividends to more shareholders, and the ownership of the company could change hands.

Generally, there are two types of shares issues. An initial public offering (IPO) is when a company offers stock for sale to the public for the first time, and the seasoned equity offering (SEO) is when a company raises more equity if it already has public shares. The following figure captures the poor condition of the Czech IPO market. There were approximately 2 IPOs on the Prague Stock Exchange per year, in contrast to Warsaw Stock Exchange and pan-European stock exchange NYSE Euronext, where tens to hundreds of IPOs were executed.

Fig. 4 Number of new companies listed through an IPO



Source: own elaboration, based on [13]

The reason why companies in the CR do not want to place their shares to Prague stock market is supposed to be a weak purchasing power on the market, caused by the lack of investors. And there are not enough investors on the capital market because of low number of shares offered by companies. The Czech capital market finds itself in the vicious circle. The lack of confidence into the capital market might be caused also by the historical development of the financial market in the CR.

The potential of business financing using share issues is very high in the CR. The companies must recognize the benefits of this form of financing, and possibly also evaluate the benefits of the innovated capital structure, based on the stock financing rather than on the debt financing (lower indebtedness).

2.4 Bond issues

A bond is a long-term contract under which a borrower agrees to make payments of interest and principal on specific dates to the holders of the bond. [12] Bonds are issued by corporations, government or municipalities as long-term source of financing. Bonds represent a kind of a debt contract that is marketable.

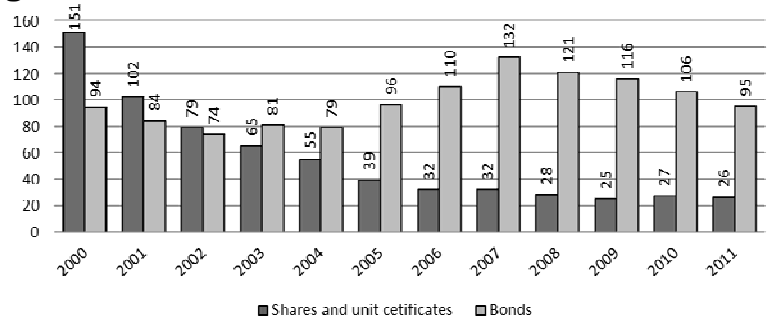
Tab. 2 Bank loans in % of total assets

Year	1998	2000	2002	2004	2006	2008	2010
Bonds issued/ total assets ratio in % (average)	0.00	0.00	0.12	0.13	0.14	0.10	0.21

Source: own investigation

Advantage of the bond issue performed by companies in comparison to the share issue is that in case of bond issue, the investors don't have any influence on company management, and ownership of the company doesn't change hands. Bonds have fixed maturity, so the financial planning of interest payments (the interest is called the coupon) is more predictable. The obligation to repay the bond is considered to be a disadvantage, which is not customary with shares.

Fig. 5 Number of listed share and bond issues on the PSE



Source: own elaboration, based on [15]

In the Czech Republic, the number of listed bonds on the official capital market – the Prague Stock Exchange (PSE) is higher compared to number of share issues – as shows figure 5. Nevertheless, according to own research [14], it was not common to use

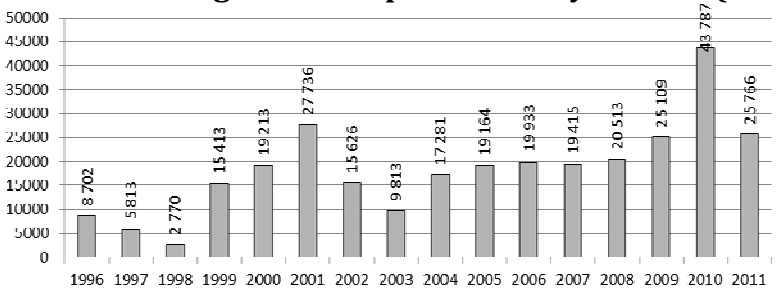
corporate bonds as a source of financing by the Czech companies in the period from 1998 to 2010. Corporate bonds represented only tenths or hundredths percentage points of total assets, and only in particular business sectors like processing industries, information and communication companies, and banking and insurance institutions.

The innovative approach of the Czech companies towards bonds is not expected in the near future, although already today some strong stable corporations (such as real estate developers) raise their sources of financing by using the instrument of bond issue.

2.5 Export financing

The supported export financing is provided for financing of exports through offering its products principally to countries where there is a significant demand for Czech goods or to countries where financing of exports by Czech commercial banks is not preferred for various reasons. From the point of view of the structure of new commitments, it is apparent that contracts securing the financing of exports through direct buyer credits prevail. The second-most applied financing method in 2011 was the financing of exports through direct supplier credits, which principally include loans provided to factoring companies for purchases of other clients' export receivables. [16] From this perspective, export financing is closely related to the previous category of bank loans.

Fig. 6 The aggregate volume of new commitments for financing loans with official support and the issue of guarantees performed by the CEB (millions CZK)



Source: the Czech Export Bank [16]

In the Czech Republic, the financing of exports perform the commercial banks and primarily the Czech Export Bank (hereinafter only "CEB"), a banking institution specialized in the state support of exports. The Export Guarantee and Insurance Corporation (EGAP) is a state-owned export credit agency, insuring credits connected with exports of goods and services from the Czech Republic against political and commercial risks. The aggregate volume of new commitments of CEB for financing loans with official support and the issue of guarantees culminated in 2010 at the level of 43 billion CZK, which is the highest result of this indicator in CEB's history.

The CEB has implemented some new innovative products and activities in 2011, focused on the segment of small and medium-sized enterprises. For example the pro-export payment guarantee is issued in behalf of commercial banks, and serves as an efficient and simple hedging instrument, the main purpose of which is to provide guarantee for the repayment of the principal of loans provided by the commercial banks to

subcontractors, who participate with their subcontractors on the exports of the Czech exporter, whose export is financed by the CEB. [16]

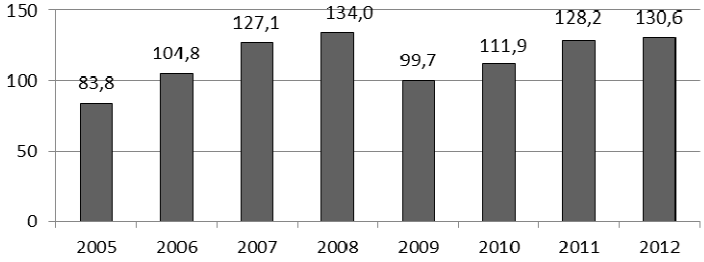
There can be found fundamental space for more innovations of export financial products, because the increase of the Czech exports is extremely important for the whole economy, and the diversification of exports and the search for new markets outside the EU remain an imperative for the coming period.

2.6 Factoring

The success of an enterprise on a highly competitive market is determined by an offer of favourable business and payment terms conditions. At the same time there may arise a certain discrepancy between the requirements of suppliers and customers. [17] Factoring represents form of short-term financing that allows eliminate this discrepancy. Factoring means a regular buyout of short-term accounts receivable by a factoring entity (a factor) under specific conditions agreed in advance. [18]

The use of factoring helps to stabilize cash-flow of suppliers as their financial sources are no longer bound in their accounts receivable (outstanding claims), and it improves their competitiveness on the market as they can offer longer terms of maturity to their customers. Factoring is therefore an important source of financing not just for big corporations, but also for small and medium-sized enterprises. [17] In practice the regressive forms of factoring prevail in the Czech Republic, however from territorial point of view, the domestic factoring prevails. [19]

Fig. 7 Development of factoring transactions by AFE CR members (in billions CZK)



Source: Czech Leasing and Financial Association [10]

The figure 7 shows the development in values of factoring transactions performed by the members of the Czech Republic Association of Factoring Enterprises (AFE CR). Factoring operations were growing quite rapidly in the period 2005 – 2008. The year 2009 was affected by the negative impact of financial and economic crises that resulted in temporary decline of factoring transactions. In the following years, there was slight uptrend again, associated with the rapid development of information technologies. The use of on-line information systems seems to be an important innovation element that facilitates and speeds up the performance of factoring companies.

3. Discussion

Potential of several sources of financing were investigated by this article, but there are more of them which weren't mentioned. Private equity and venture capital belong also to this category. Private equity is a form of equity investment into private companies that are not quoted on a stock Exchange, and it is distinguished by its active investment model, in which it seeks to deliver operational improvements in its companies over several years. Venture capital is a type of private equity focused on start-up companies. The market of private equity is still in the early stage of its development in our country, and the increase of these investments can be expected, especially in the technological fields, as demonstrated by the development in the U.S., where private capital investments were at the birth of the technological giants like Microsoft, Hewlett-Packard, Google, or Facebook. Grants and subsidies from the government, municipalities or various special-purpose funds may represent another form of financing, which may bring innovation of the corporate approach towards financing in the future.

Conclusion

The article attempts to trace possible prospects and trends in corporate financing from the two points of view: the first point of view was the examination of various sources of financing as of products appropriate for innovation, and the second point of view included exploring of possible changes in the corporate capital structure with increased or a reduced utilization of the particular source of financing. These innovations could also contribute to the boost of competitiveness of the companies. The article focused on some traditional (bank loans, leasing), and some other sources of financing (share and bond issues, factoring, export financing, private equity and venture capital, grants and subsidies) which could possibly bring innovations into the typical capital structure of Czech companies. The paper with the help of own investigation revealed a substantial potential for capital structure innovations by the Czech companies; as the companies were very conservative in the two last decades in their financial decisions. New financial products, changing world, modern technologies, and innovative attitudes will possibly result in changes in corporate capital structure.

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Media and Regional Capitals in the Czech Republic: A Quantitative Perspective

Abstract

Marketing environment of any entity is created by demographic, economic, legislative, social, natural and technological domains. All of them represent mutually interconnected systems. Albeit territorial marketing suffers from numerous methodological misunderstandings so far, marketing milieu of individual towns and regions is affected by the very same systems as mentioned above. Media can be treated as one of the most important determinants shaping the marketing environment of territorial units. The situation is even more intriguing in transition/post-transition countries, among which Czech Republic can be ranked. There are only little doubts that topics appearing in media co-determine the formation of mental maps and subsequently also socioeconomic developments in individual territories. Nonetheless, taking into account the scope of this article, our attention will be focused on contributions in national TV coverage, which are related to individual regional metropolises in the Czech Republic. The amount of regional capitals at NUTS III level in the country is 13. Quantitative analysis will be devoted to the quantity of afore contributions as towns that disappear from media space become less conspicuous also in real life. These contributions will be evaluated also in a wider context, i.e. the distance of individual towns from the media headquarters located in the capital city and the population of individual regional capitals will be considered too. In order to quantify and evaluate mentioned dependencies it will be used the methods of regression and correlation analysis.

Key Words

Czech Republic, media, regional development, regression analysis

JEL Classification: C12, C51, R19, R50, R58, R59

Introduction

Territorial marketing becomes increasingly popular notion of our times. Although there are numerous disputes concerning its delimitation, we are basically dealing with the attempts to adapt marketing instruments to the needs of particular towns and regions. Still, satisfactory definition of territorial marketing constitutes rather uneasy task just for the sake of the fact that town or region represent much more complex unit than enterprise itself. Common signs of territorial marketing can be thus found rather in used instruments, methods, concepts or common objectives [1], [3], [4] and [5].

Regional and urban marketing embody one of the consequences of immense social and economic transformations that took place between 1970-ies and 1980-ies in virtually all developed countries and are succinctly describable as the move from fordist paradigm of societal development towards a post-fordist one. Not surprisingly, territorial marketing is even more intriguing in transition/post-transition countries, among which Czech Republic can be ranked, see [7], [10].

One of fundamental tasks is the delimitation of basic categories related to territorial marketing. Marketing milieu is of utmost importance in this respect. Marketing environment of any spatial unit is given by demographic, economic, legislative, social, natural and technological spheres, which actually represent complex and mutually interconnected systems. Marketing milieu can be affected by both internal and external factors. Media coverage should be comprehended as one of the most important representatives of the latter.

Currently, there are only little doubts that media created the milieu that shapes our everyday activities. Media influence both individual entities as well as whole territories. Succinctly, individuals or enterprises that do not appear in media are losing their existence in virtual world and become inconspicuous also in the real world. And the same applies to territories of various scales. Territories without media publicity are largely omitted by investors, tourists as well as wide public.

If the territory in question appears in media it still does not mean any victory as investors, tourists and the wide public are pretty sensitive on the composition of news about individual territories. If the city or regions are depicted in a positive way, it often lures the above mentioned target groups; vice versa, negative news repel these target groups and the region can easily fall into psychological and economic vicious circle. Briefly speaking, media in relation to urban and regional development do matter [9].

The main objective of the paper consists in quantitative analysis and interpretation of contributions in national TV coverage, which are related to individual NUTS III regional capitals in the Czech Republic. Quantitative analysis will be devoted to the number of these contributions because towns, which disappear from media space become less conspicuous also in common life. These contributions will be evaluated also in a wider context, i.e. the distance of individual towns from the media headquarters located in the capital city and the population of individual regional capitals will be considered too.

For the purposes of this research, authors focused on TV. TV coverage has one of the highest impacts on the public on the one hand and is representative enough on the other. Moreover, comparisons show that TV coverage agenda to a large extent represents also press or radio coverage agenda [6], [11]. That is why TV coverage will be taken as a point of departure for this research.

TV coverage we investigated was represented by evening news of 2 principal TV companies in the Czech Republic. The research thus monitored Události of Czech TV and Události, komentáře of Czech TV both of them representing public TV. On the contrary, Televizní noviny constitute the part of private TV Nova air time. Our research covers the

period between 2004 and 2010, which (taking into account the newness of the whole topic) is maximum possible time in this realm. On the other hand one can already get at least an essential overview of developmental tendencies in the researched sphere.

It is also worth reminding that activities happening in any territory are always bound to the population living in the given space. That is why in this paper we focus just on population size of regional capitals and disregard political, cultural and economic activities.

The hypothesis tested in this paper is thus as follows: H1: Distance of the examined regional capital from Prague TV headquarters plays significant role in relation to the number of contributions in national TV coverage related to individual regional metropolises.

In order to perform a basic quantitative analysis of the data processed for particular regions represented by regional capitals of the Czech Republic and verify the hypothesis H1, it has been chosen the methods of regression and correlation analysis.

1. On the importance of media

Wide public is usually expecting that media bring objective, accurate and unbiased depiction of reality. However, we can feel safe enough to claim that nowadays media can be already perceived as co-creators of the environment we are living in. Taking into account the great and steadily growing interconnectedness of the world, media can show just selective cuts of complex reality. People are thus informed about the events but at the same time media more or less conspicuously direct their behavior and the perception of reality. Many people even accept opinions presented by media in a very sophisticated way. Agenda-setting, i.e. accentuation of chosen events or agenda-cutting, i.e. ignorance of selected occurrences play increasingly important role in this context.

At the same time, we face the real problem of checking whether media fulfill their mission, i.e. objective and unbiased coverage. Moreover, media represent increasingly aggressive institution. It should be reminded that the quality of information is dependent on the way of interpretation and explanation of events or phenomena [11].

From spatial point of view, media constitute certain informational gate between inner, i.e. urban and regional actors of territorial development and outer groups, such as visitors, potential visitors, investors, non-regional entrepreneurs etc. Local/regional politicians, institutions or entrepreneurial subjects strive for the attraction of media attention and address their voters, citizens or employees just by means of media. And vice versa, these relevant players of local and regional development get the important information for their decision-making through media again. Subsequently, we are currently entitled to speak about media-territorial or directly meditorial development, rather than about mere territorial development [9].

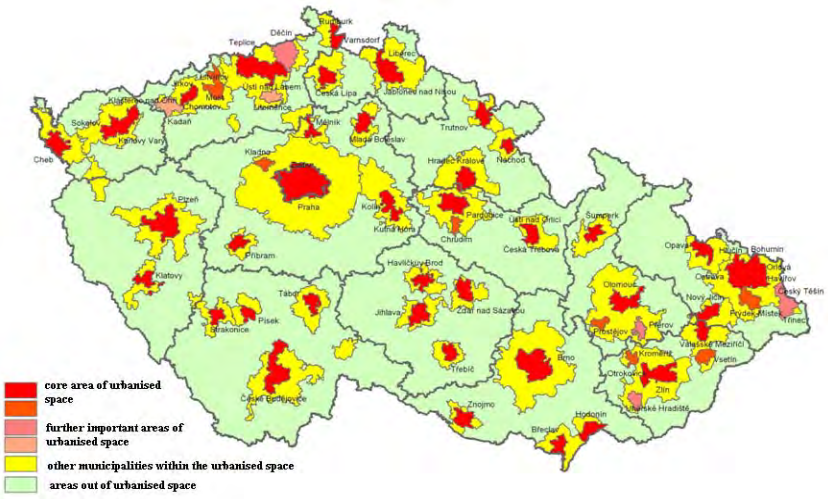
From scalar-territorial point of view, we can distinguish local, regional and national media. Obviously, national media are the most influential ones. For the purposes of our work, we will focus primarily upon national media as they inform not only about national or foreign issues but also about particular territories. And just the news concerning territories that resonate at the national level considerably co-determines the formation of mental maps.

In many countries, the spatial distribution of media is rather centralized and all decisive media are concentrated usually into the capital city, which is also the case of Czech Republic. At the same time, one has to consider that above media centres typically act also as an administrative, political and socio-cultural hearts of the country. This is the factor that may affect the territorial objectivity of the news as well as geographical distribution of news within the existing settlement system.

2. Several notes on the settlement system in the Czech Republic

Settlement system of the Czech Republic is rather homogenous, see also Figure 1. Its next important feature is that distances are not so high due to the area of the country as well as relatively developed transportation system. Geographical distribution of regional metropolises is in compliance with afore mentioned spatial pattern of settlement structure [8].

Fig. 1 Settlement structure of the Czech Republic



Source: authors

As for population size of researched regional capitals, one can contemplate a distinctive dominance of Prague. Population strength of Brno and Ostrava is also distinctive, which applies also to Plzeň, but a bit less. The group of towns with more or less equal population size follows and they include: Liberec, Olomouc, Ústí nad Labem, Hradec Králové and České Budějovice followed by Pardubice. Zlín has basically isolated position

on the ladder of settlement hierarchy and smallest regional capitals are represented by Jihlava and Karlovy Vary.

It is worth noticing that when evaluating population size of researched towns, we concentrated only on the number of inhabitants within administrative borders of individual towns and disregarded wider urban agglomerations. Nonetheless, inclusion of these urban agglomerations would not change the results of our analyses significantly.

3. Tools for Quantitative Analysis

As it has been already mentioned in the Introduction section, in order to verify the hypothesis H1, it has been chosen the methods of regression and correlation analysis. The regression and correlation analysis is a useful tool for quantifying the relationships between variables. The main objective of regression analysis is to examine the causal relationships between two or more quantitative variables. If we calculate the characteristics of this relationship, especially the mean and variance, or even the degree of their dependence in the terms of covariance, we can begin to examine how to express these relationships mathematically.

The basic task of the regression analysis is to find a suitable regression function or functions, which models deterministic, i.e., identifiable and predictable component of estimated regression model. As a regression function one can choose theoretically any mathematical function. We cannot choose regression function $y = f(x)$ completely arbitrarily. However, we have to find a function which penalizes the dependence of variables *X* and *Y* in a best way. For practical reasons, it is usually chosen the simplest functional dependence. In this paper, it will be chosen a linear function as a first step of our analysis, and a nonlinear dependence in the shape of a hyperbolic function as a next step.

When a regression model has been constructed, it may be important to confirm the goodness of fit of the model and the statistical significance of the estimated parameters. Commonly used checks of goodness of fit include the *R*-squared, analyses of the pattern of residuals and hypothesis testing. Statistical significance can be usually checked by an *F*-test of the overall fit of the model, followed by *t*-tests of individual parameters, see [2] for details.

The main aim of regression analysis is not only to find a suitable regression function, but also to express the intensity, strength or tightness of dependence that describes this function. It is clear that the stronger dependence means the greater role of deterministic component in the regression model and also the smaller influence of the random or error component. In other words, a random component has to be minimized. In addition, the error term of the model must fulfill certain statistical assumptions.

In order to minimize the residuals of regression model it is usually used the Ordinary Least Squares method. Using this method, we are looking for the regression function that meets certain conditions which concern the error term. As a suitable marker of the

relationship between variables *X* and *Y* estimated by regression function it could serve coefficient of determination or the *R*-squared. This indicator would tell us how much of the variability can be explained by *Y* dependence on the variable *X* by the regression function. In other words, the higher the value of *R*-squared means that individual observations are more closely around the regression line and the estimated regression function expresses the relationship of *X* and *Y* in a better way.

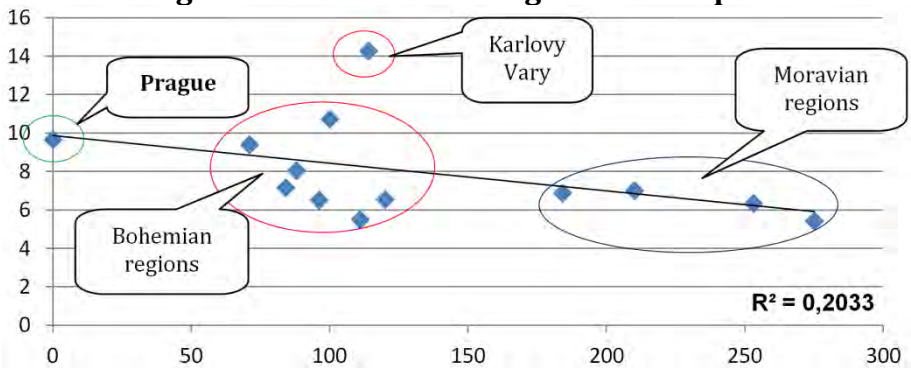
4. Quantitative Views on News Concerning Regional Capitals

The empirical analysis was performed on the unique data that was purchased from Media Tenor, Ltd., which deals with a systematic and continuous analysis of media reports in the Czech Republic. Media Tenor, Ltd. offers a complete set of analytical services based on the content analysis of media, providing feedback and communication activities, accurately evaluates the quantitative and qualitative aspects of media publicity. Analytical and consulting services are usually used by private companies, local government, political parties, PR agencies, media editors and academics.

In this paper we analyzed a number of contributions on regional capitals in head news of the public Czech TV (Události and Události, komentáře) and private TV Nova (Televizní noviny) in the period from 1 April 2004 to 31 December 2010. For the purposes of our analysis contributions have not been divided into categories. In other words, we have abstracted from the qualitative aspects of the analysis in this paper.

The aim of this paper is to evaluate and verify testing hypothesis H1 using the methods of regression and correlations analysis. Population statistics of regional capitals in Czech Republic have been found from the official website of the Czech Statistical Office as published in Census of Population and Housing in 2011 year. Distance of regional capitals from Prague has been measured as a direct distance in kilometers. Data have been obtained from Google Maps application.

Fig. 2 Linear regression model: Number of contributions per capita in national TV coverage vs. distance from Prague TV headquarters



Source: authors

As a first step of our analysis we estimated linear regression model which measures dependence between numbers of contributions per capita (more precisely on 1000

inhabitants) related to individual regional metropolises in national TV coverage on distance of regional capital from Prague TV headquarters. Results of the regression analysis are shown in graphical form in Figure 2, the basic regression statistics are then presented in Table 2.

Tab. 2 Linear regression model statistics: Number of contributions per capita vs. distance from Prague TV headquarters

Coefficient of determination (correlation coefficient)	0.2033 (0.4509)
Significance of model (F-test)	0.1220
Significance of intercept and distance from Prague (t-test)	0.0000 and 0.1220

Source: authors

Since the value of the significance of the model has reached the value of 0.12 only, we can conclude that estimated linear regression model is not been statistically significant at 5% significance level. Linear model shows one outlier, namely Karlovy Vary which has the number of contributions per 1,000 inhabitants significantly higher. For the above mentioned reasons, as the next stage of our analysis, we estimate the nonlinear model in the shape of a hyperbolic function. This nonlinear function would express the dependence between the numbers of contributions per 1000 inhabitants on the distance from Prague TV headquarters better than the linear model.

Since the distance of Prague from itself is equal to zero, we cannot use basic hyperbolic regression model. Hence, we have to transform mentioned nonlinear hyperbolic model on the linear dependency. As dependent variable it will be used the population of the regional capital per contributions per year. The recalculated values of the population per contributions per year and distance of regional capitals from Prague are presented in Table 3.

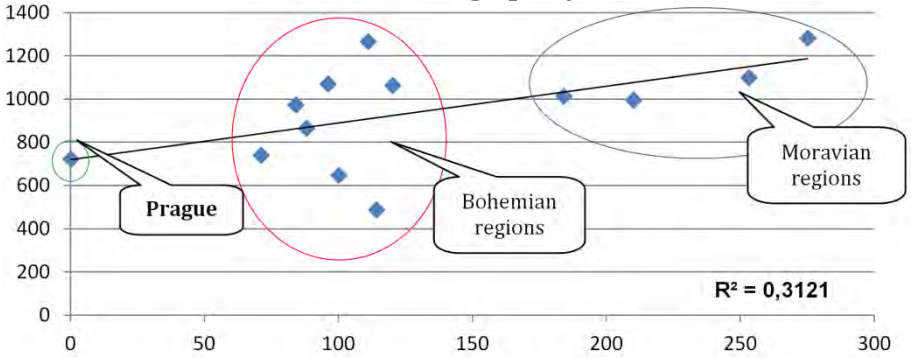
Tab. 3 Distance from Prague and population size of the regional capitals per number of contributions per year

Regional Capital	Distance from Prague in km	Population Size	Contributions/Year	Population size/ Contributions/Years
Brno	184	384 277	378.57	1015.07
České Budějovice	120	93 883	88	1066.85
Hradec Králové	100	94 242	144.71	651.23
Jihlava	111	50 760	40	1269.00
Karlovy Vary	114	53 737	109.71	489.79
Liberec	88	102 247	118	866.50
Olomouc	210	100 043	100.29	997.58
Ostrava	275	302 456	235.43	1284.70
Pardubice	96	91 073	85	1071.45
Plzeň	84	169 688	173.86	976.02
Ústí nad Labem	71	95 003	127.71	743.87
Zlín	253	76 010	69	1101.59
Praha	0	1 272 690	1757.57	724.12

Source: authors

Results of transformed linear regression analysis are shown in graphical form in Figure 3, the basic regression statistics are then presented in Tab.4.

Fig. 3 Transformed linear regression model: Population size per number of contributions in national TV coverage per year vs. distance from Prague



Source: authors

Tab. 4 Transformed linear regression model statistics: Population size per number of contributions in national TV coverage per year vs. distance from Prague

Coefficient of determination (correlation coefficient)	0.3121 (0.5587)
Significance of model (*F*-test)	0.0472
Significance of intercept and distance from Prague (*t*-test)	0.0001 and 0.0472

Source: authors

Since the significance of the model has reached the value of 0.0472, we can conclude that the estimated transformed linear regression model is statistically significant at 5% significance level. In addition, independent variable (distance from Prague TV headquarters) and intercept are statistically significant as well. Moreover, estimated model doesn´t show any outlier. Analyses of the pattern of residuals confirmed that regression error term meets required conditions as defined in the Section 4.

Please, note that linear dependence can be rewritten in the shape of hyperbolic function as expected in the second step of empirical analysis. Mathematical formulation of estimated transformed linear regression model can be also written as follows:

$$\text{number of contributions / year} = \frac{\text{population size}}{1,703 \cdot \text{distance from Prague} + 719,5}. \qquad (1)$$

When analyzing Figure 3, it the can be identified overall three separated segments, namely Prague, Bohemian and Moravian regions. The results of transformed linear regression model mean that segmentation of regions is greater by the distance of regional capitals from Prague TV headquarters than by the number of contributions in national TV coverage per year. There is also a greater variance of the number of contributions among Bohemians regions than in the group of Moravian regions. It cannot be said that the Moravian regions have less contributions per capita than Bohemian ones. Moreover, we also cannot say that Prague have more contributions per

capita than the Bohemian regions. However, it is possible to argue that the Moravian regions have less contributions per capita than Prague. In general, we can conclude that the hypothesis H1, which has been defined in the Introduction section, cannot be rejected.

Conclusion

Media became one of the most important factors affecting spatial developmental tendencies. In spite of this fact media territorial connotations are stressed only seldom. Our research confirmed that there exists a distinct differentiation in the number of TV contributions related to regional capitals in the Czech Republic. Basic spatial pattern of this phenomenon was revealed too.

In this paper we empirically tested hypothesis H1 which examined potential dependence of distance of the analyzed regional capitals from Prague TV headquarters in relation to the number of contributions in national TV coverage related to individual regional metropolises. In order to verify hypothesis H1 we utilized the methods of regression and correlation analysis.

As a first step of our analysis we estimated linear version of regression model which was not statistically significant. Hence, in the next step we calculated a nonlinear dependence in a shape of hyperbolic function which was transformed into linear dependence because of mathematical reasons. This model was statistically significant at 5% significance level. Therefore, we were able to make reliable conclusions.

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Business Process Performance Management – A Modern Approach to Corporate Performance Management

Abstract

Since the end of the last century the pressure of globalization and internationalization on worldwide market has been rapidly increasing. Together with this trend innovation pressure has become stronger. Business competitiveness is conditioned by the innovation ability not only of products but also of processes. Enterprises therefore have started to move attention from product quality to effectiveness of internal business processes. Increased emphasis is laid on the performance management of internal processes. Shareholders and managers are more oriented on the long term development and prosperity instead of orientation on short term revenues achievement. When talking about managerial decisions we can even often hear terms such as strategic system of corporate performance management and process approach to management. These modern concepts for corporate performance measurement and management include not only financial dimension but also non financial indicators such as customers, internal processes, learning and growth and customer satisfaction. The object of interest in this paper is a modern management approach based on corporate performance measurement through internal business processes performance measurement. The paper deals with fundamentals of process management and process performance. It is focused on modern concepts, methods and tools for business process performance management. The attention in the paper is paid also to research results focused on using modern methods of business process management in Slovak industrial enterprises from selected branches. The aim of the research was testing the hypothesis: enterprises using process performance management and its methods have been reaching more positive values of indicator ROE representing a basic indicator of corporate performance. Our findings regarding influence of using process performance management methods on corporate performance are presented in the paper.

Key Words

corporate performance management, process approach, business process, business process performance management

JEL Classification: M19, L25, D22

Introduction

Corporate performance is an object of interest not only of owners (shareholders) but also of other interested subjects such as managers, employees, creditors, customers, suppliers, municipality and state. According to economic theory a corporate performance is determined by the level of transformation process – process of inputs to

outputs change and their correlation reflect a level of appreciation of inserted means and reproduction process effectiveness. In our opinion the corporate performance can be defined as an ability to reach required effects and outputs in measurable units, to evaluate spent resources and to create a profit. Management of corporate performance presents a way of motivation and management by objectives characterized on the base of quantitative performance indicators. [1] Successful economic development and market environment development require besides the application of traditional methods in business also the application of new modern methods adapted to the contemporary market needs, requirements and conditions. In the present new approaches to corporate performance monitoring are winning their recognition. They are based on traditional systems of financial indicators and are completed by time and qualitative indicators. One of modern approaches is based on corporate performance measurement by means of internal processes performance measurement. Business internal processes are objects of process approach to management that has been formed during this century. Principles and methods of process management enable continual measurement and improvement of business processes performance and thereby corporate performance.

1. Business Process Management

Under the term process we understand activity set creating a final value for customers. The process can be featured as a complex of exactly defined activities that have to be accomplished in certain order keeping ordered quality in effort to achieve specified goal. Business process can be characterized as a complex of activities which due to one or more inputs creates output bringing a value for internal or external customer. [5] If we want a business process to have required quality, implied controls of process inputs and outputs operations are needed.

Business processes are objects of process approach to management based on enterprise search and analysis from the view of business activities and activities performed by managing staff. Basic idea of process approach is that reasons of low business performance are ineffective internal processes which should be changed towards efficiency increase and the highest added value for customer. Process management presents systems, procedures, methods and tools for sustainable securing maximal performance and continual improvement of business processes with aim to fulfil determined strategic goals. [4, 12]

Performance of business processes presents a rate of required results achievement in the process, its size is expressed by the gap between existing and required result. [11] The result presents a goal and its measure is an indicator. To achieve an effective management of process performance it is needed to draw clear organizational and individual goals based on financial and other non-financial indicators. Term business process performance is closely connected with the terms quality and productivity. Quality presents a complex of own product features able to satisfy customer requirements. Productivity presents a ratio between inputs and outputs. Productivity relates especially to effective resources and inputs utilization needed for running of

specific process. The better the input utilization is the higher the process productivity is. [12]

Contents (life cycle) of process performance management includes following phases: process identification (process map assembly, determination of process parameters and internal structure), process measurement (setting indicator of process performance, determination of desired indicator value, measurement of reaching values), process improvement (process reengineering presents a radical process change and Kaizen a conception oriented on continual process improvement). [8]

2. Methods and Tools of Business Process Performance Management

At present a number of methods and tools focused on corporate performance measurement and management exist in enterprise environment. Defaults of traditional performance management and measurement systems have been solved through additional methods focused on business processes. To the best known concepts and methods belong: Balanced Scorecard (BSC), Six Sigma, Activity Based Costing (ABC), European Foundation for Quality Management (EFQM), Total Quality Management (TQM), Total productive maintenance (TPM), Kaizen, Method 5S, ISO Norms, Benchmarking, Process controlling.

Balanced Scorecard is a conception for performance measurement and evaluation that transforms a business strategy into a form of balanced indicators crucial for its implementation. Goals and measures of BSC come out of corporate vision and strategy and monitor its performance in four perspectives: financial, customer, internal processes and learning and growth. The goal of BSC is achieving the balance between neutral and value indicators, external and internal performance factors, moving powers and overdue indicators and especially between long-term and short-term goals. Balanced Scorecard is a method enabling to transfer corporate vision and strategy to a complex set measures of process performance. [3] In the internal process perspective managers find out crucial internal processes wherein excellent results have to be achieved. These processes enable to provide valueable advantages interesting for customers and help keep them. BSC uncovers fully new processes important for customer needs fulfilment and financial goals achievement. This BSC perspective emphasizes processes which do not have to exist and run but are indispensable and important for corporate operation and success. Measures of internal processes deal with approaches that have the largest influence on customer satisfaction and financial goals achieve. Enterprises develop goals and measures for internal process perspective usually after determination of goals and measures from the customer and financial point of view.

Six Sigma is a complex methodology involving vision and philosophy focused on process effectiveness increase through output quality improvement. At once the methodology includes management system leading improvement teams in projects of scanning, suggestion and implementation of process changes. Six Sigma presents a systematic

approach to quality using directed search of reserves in business processes. Methodology Six Sigma has been used in processes that need to decrease a variability of output features and error rate. Tools used by this method are focused on minimizing the common reasons for error rise, improvement of process output quality, lowering operation costs, process performance increase and eliminations of errors caused by other influences. Six Sigma is based on structural approach to improving activities by cycle DMAIC: Define – Measure – Analyze – Improve – Control. [6]

TQM is an open system able to involve everything that can help a maximal customer satisfaction, trust and minimizing sources spent on defaults and errors. Thereby the prerequisites for profit maximizing, competitiveness increase and minimizing the costs on non-quality have been crated. The conception is considered a management philosophy not bounded with norms and rules but as an open system able to absorb all positive for corporate development. TQM as a complex approach to quality provides to the enterprise a big competitive advantage because of its focus on employee motivation and continuous improvement of process quality. It enables also flexibility in reaction to customer requirements not only in their fulfilment but also in creation of new features. [4, 7]

Model EFQM emphasizes the role of leadership in an enterprise, used strategy and planning, impact on employees, utilized sources and partnerships, basic prerequisites of smooth process running. The essence of EFQM model is formed by logics RADAR including five elements: Results, Approach, Development, Assessment and Review. [2] Model EFQM has 9 main and 32 particular evaluative criteria. One of the criteria is the processes criterion that is the most important for process management. It is focused on evaluation of how the organization proposes, manages and improves its processes in regard to its policy and strategy and on the satisfaction of customer and other interested subjects requirements.

Total productive maintenance (TPM) represents the interconnection of production and maintenance with technical provision of technology and construction. TPM is an activity set covering all enterprise departments with following aims: to create structure providing for a maximal effectiveness of production systems, to provide for a decrease of failure rate, errors and other loss on equipment, to increase equipment effectiveness, to create ideal working conditions, to motivate and connect all employees to improvement process, to reach zero loss and create a profit. [10] In the practise this system is based on principle of early detected abnormalities rising accidentally by machine operation and on their professional elimination. One of the progressive elements of TPM is a transfer of responsibility for machine directly to machine operator, based on fact that operators are in permanent contact with machine so they can as the first ones detect rising abnormality as a potential basis of error or breakdown rise.

The method 5S belongs to the typical tools used in process improvement based on wastage elimination on workplaces. Everything increasing products or service costs without increasing the value is considered wastage. The method 5S reduces and visualizes wastage and achieves simplification and improvement of material flow, material, stocks and equipment allocation. [4, 12] The name 5S comes from Japanese

words: Seiri (sort), Seiton (straighten), Seiso (shine), Seiketsu (standardize), Shitsuke (self-discipline, sustain). Among main advantages of this method we can assign stock reduction, corporate culture improvement, working space reduction and quality improvement.

Substance of term Kaizen consists in continual improvement and innovating. The matter of this concept is statement: no one day without any improvement. Kaizen is a thinking source focused on process, people and their work effort. The conception emphasizes management support and stimulation of employee's effort to improve a production process in small steps. The goal of system Kaizen is to manage processes in the way that effects in the form of higher performance, shorter delivery periods and lower costs are achieved gradually and automatically. [7]

Activity Based Costing is a method measuring costs and performance of cost objects, activities and sources. Basic principles of the method are an assignment of spent sources to activities and follow assignment of activities to cost objects (products, customers, markets). It is a method providing true information about real costs of running processes. It enables to determine, measure, plan and control process costs. [8]

Benchmarking is a process of systematic and permanent comparison of reached indicators value with the best enterprises active in the same branch. It represents a tool for effectiveness and performance increase of an enterprise. There are several types of benchmarking. Internal benchmarking is focused on comparison within an enterprise. [2, 4] External or competitive benchmarking is focused on comparison of similar or same activities with competitive enterprises. Functional or branch benchmarking compares processes or functions within different industrial sectors. Generic or process benchmarking deals with process of product creation. It compares searches and analyses process performance and functioning with the best enterprises in implementing the same processes. Its task is to find out the best practices of particular processes that lead to excellent performance. Process benchmarking answers the question: how is the enterprise reaching excellent performance.

3. Level of Process Performance Management in Slovak Enterprises – Primary Quantitative Research Results

Current situation in the area of performance management has been analyzed through primary quantitative research in Slovak enterprises using a method of questionnaire.

3.1 Research Design

The research objective was the analysis of using the traditional and modern methods and tools for process performance management and measurement in Slovak enterprises from selected industrial branches. An integral part of research objective was the

verification of the hypothesis: enterprises using process performance management and its methods have been reaching more positive values of indicator ROE.

In the first step a database of enterprises data has been created. The information sources came mostly from the Internet databases and Statistical Bureau. The database size was 2,235 enterprises from branches of engineering, construction, automotive and wood-processing industries. By means of Internet applications an on-line questionnaire has been created and distributed to enterprises. Data collection was carried out in the first quarter of 2013 and an on-line database for data collection was created. Number of returned filled in questionnaires was 156 that is a representative sample in the research.

Questionnaire questions were divided into three areas: common characteristics (branch, region, ownership, number of employees, activity orientation, type of production organization), financial results (turnover, indicator ROE) and area of internal processes. Questions concerning internal processes were as follows:

- What qualitative level corresponds with implementation of processes in your company?
- What level of elaborated process map does your company have?
- What methods are used in process management in your company?
- What indicators for production process performance measurement are used in your company?
- What indicators for evaluation of employee performance in processes are used in your company?
- What internal processes and their indicators are regularly measured and evaluated in your company?

3.2 Results

In this part of paper we will show selected research results that present a level of business process performance management in Slovak enterprises and enable the verification of the stated hypothesis through the existence of connections between an effective process performance management and reached value of ROE indicator as a representative indicator of corporate performance.

The research results showed in Figures 1 and 2 indicate that enterprises with management of process on the highest level (optimalized) reached the highest values of ROE indicator. In automobile industry 33 % of enterprises implemented processes on the highest qualitative level and reached indicator ROE in the value over 7 % and in 13 % enterprises it is more than 10 %. In engineering industry 18 % of enterprises have the highest level of process management but only 12 % reach the highest values of ROE indicator. In wood-processing industry 15 % of enterprises present process implementation on the highest qualitative level but only half of them reached also the highest value of ROE indicator, the rest reached ROE in the scale of 4 – 7 %.

Fig. 1 Reached value of indicator ROE

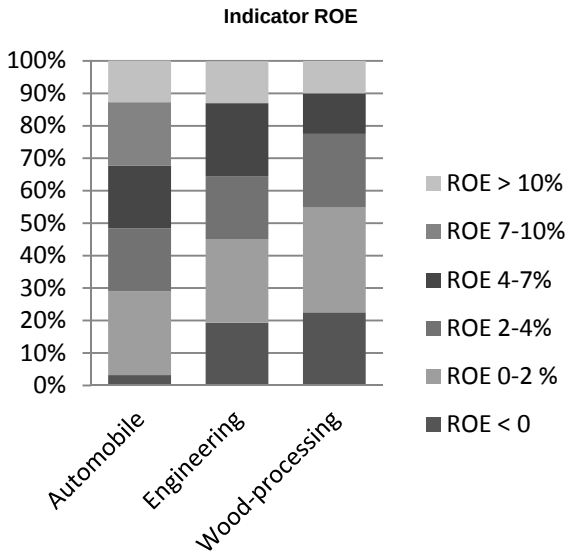
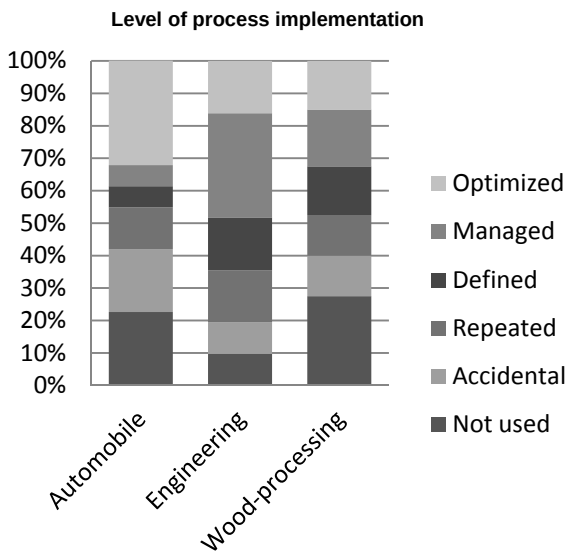


Fig. 2 Quantitative level of process implementation



Source: Own primary research

Interesting is a finding that 40 % of automobile enterprises do not manage processes however most of them reach low but plus values of ROE. In engineering industry 20 % of enterprises do not manage processes and present minus values of ROE indicator. The worst results are in wood-processing industry where in 50 % of enterprises the processes are implemented without existing system of process management and these enterprises reached minus value or low plus value (up to 3 %) of indicator ROE. In enterprises of all industries the fact that processes management on the medium level brings medium values of ROE indicator (2 – 7 %) is valid.

Answers to question concerning the use of methods of process performance management (see Figure 3) brought following findings: Wood-processing enterprises in 50 % do not use any modern method; the rest applies only one method: traditional ISO standards (35 %) or Kaizen (10 %) or benchmarking (10 %). Enterprises in automobile industry use 2 – 3 methods together; almost all enterprises manage processes according to ISO standards. As for modern methods the most used are the conceptions TQM (32 %), Kaizen (23 %), 5S (23 %), TPM (16 %) and Benchmarking (23 %) and the least used are BSC (3 %), EFQM, ABC (6 %) and Six Sigma (10 %). Engineering enterprises use 2 methods together, 35 % of enterprises do not use any method and 55 % use traditional method – ISO standards. As for modern methods the most used are TQM in 23 %, Six Sigma, ABC and TPM in 16 % and BSC, Kaizen, Benchmarking in 13 %. The least used methods are EFQM (3 %) and 5S (9 %).

As for regularly measured and evaluated processes (see Figure 4), the most processes are evaluated regularly in engineering enterprises: 3 – 4 processes, especially production process in 80 % of the enterprises, process of repair and maintenance in 58 %, sale process in 52 %, health and safety process in 48 % and logistic process in 45 %. In automobile industry the enterprises evaluate regularly maximally 3 processes: production (55 %), sale (45 %), health and safety (48 %), logistic process, repair and

maintenance in 39 %, marketing in 20 %. In 20 % of enterprises the processes are not regularly evaluated. Wood-processing enterprises evaluate less than 3 processes. In 77 % enterprises it is production process, health and safety in 42 %, sale in 45 % and logistics in 38 %. Processes are not regularly evaluated in 15 % wood-processing enterprises. In all three branches the least attention is paid to innovation and marketing processes.

Fig. 3 Used methods of PPM

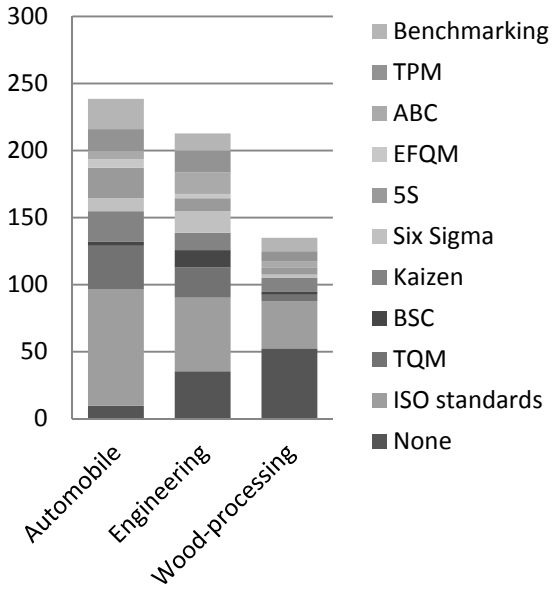
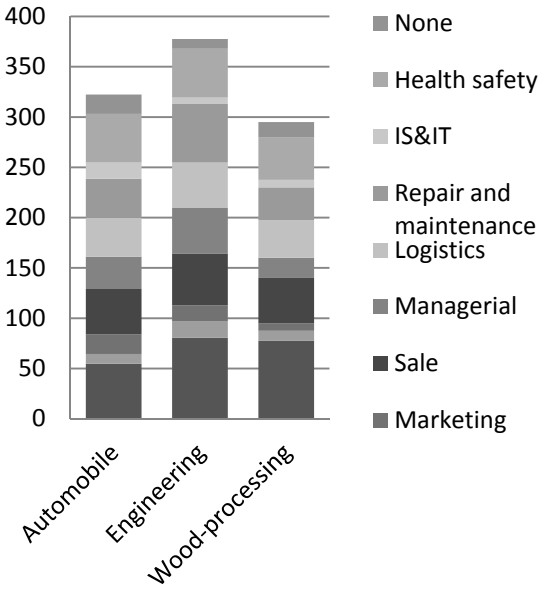


Fig. 4 Regularly evaluated processes



Source: Own primary research

The found out results in primary research show that enterprises with process implementation on the highest qualitative level (optimalized) use modern methods and concepts of process performance management, especially TQM, Kaizen, TPM and reach the highest values of ROE indicator. The best results are achieved in enterprises from automobile industry that is in Slovakia represented by international corporations with 100% foreign capital.

Conclusion

Results of primary quantitative research in Slovak industrial enterprises confirm hypothesis that enterprises using modern methods of business process performance management have reached the best results of corporate performance. We can state that business processes are a basic source of corporate performance evaluation. Important is to know the process improving the total performance the most so that attention of manager can be focused on critical (key) areas. Business process performance constitutes one unit with total corporate performance. There is a direct and strong connection between them. That is why some authors consider also strategic system of performance measurement (BSC or Zairi and Sinclair model) to be a system of business process performance measurement. Activity based costing method can be considered an intersection between controlling and management of process performance. Using

mentioned method and indicator EVA a company can calculate a real profit that leads to correct economic decisions. In spite of this, in the Slovak enterprises the method ABC and indicator EVA are used in a small rate. Slovak enterprises should pay an increased attention to regular evaluation and improvement of innovation processes and marketing process. Innovations are a basic prerequisite to keep and increase competitiveness. An effective management of innovation processes can contribute to corporate performance growth the most.

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Stock Market Modelling Using Markov Chain Analysis

Abstract

Price reduction and increased computation performance as well as the development of electronic databases bring new possibilities for analysing and predicting stock markets. This study is focused on modelling share price changes using Markov chain analysis (MCA). The aim of the study is to analyse the possibilities of MCA usage for construction of technical analysis (TA) indicators. The study is based on the data from the Prague Stock Exchange in the space of 7 years from 2 January 2006 until 2 January 2010, specifically for the close daily prices of the following shares: ČEZ, Komerční Banka and Telefonica O2. Out of these close prices the share price daily change and the share price cumulated change for a certain period of time have been calculated. The length of time period has been determined by the number of growing or decreasing close prices in sequence. According to daily and cumulated share price changes three models with different discreet state spaces have been defined. For each model we have calculated the number of individual states, the conditioned probabilities of transition between particular states and conditioned probabilities of transition into growing and decreasing states. Calculations have been carried out in MS Excel using algorithm programmed in VBA. Gained results show that for a conveniently defined state space, models based on MCA could be usable for TA. Making use of these models for construction of TA indicators will be the objective of other research.

Key Words

Markov chain analysis, transition probability matrix, trend prediction, time series analysis, technical analysis

JEL Classification: C02, G13, G14, G19

Introduction

Price reduction and computation performance improvement as well as the development of electronic databases bring new possibilities for analysing and predicting stock markets. For prediction of future share price development at stock markets investors use, from the methodological point of view, one of the following approaches: fundamental analysis, psychological analysis or technical analysis (TA). TA works on the assumption that all the relevant information (fundamental and psychological) is already included in the market price. TA is understood as a complex of methods which, on the basis of past prices and trades volumes, generate purchase or sale signals. It has to be mentioned that there are never-ending discussions about the fact whether the prices of financial assets are predictable or not. Academicians, in contrast to merchants, have been sceptical for a long time about the possibility of predicting the prices. The reason has been the universally accepted Efficient Market Hypothesis by Fama [3] which excludes the possibility of reaching

above-average profits. The other reasons have probably been some often and widely quoted negative empirical studies of technical analysis in the stock market, such as Fama and Blume [4], and Jensen and Benington [3]. However, recent studies such as Sweeney [5] and Brock et al. [1] demonstrate that methods based on past prices and volumes analysis are capable of outperforming the market.

This study deals with stock market modelling using Markov chain analysis (MCA). Markov chain (MC) is understood as a sequence of discrete random variables X_1, X_2, X_3,.... with the Markov property which can be formally described as follows:

$$P\left(X_{n+1} = x_{n+1} / X_1 = x_1, X_2 = x_2, \ldots\ldots X_n = x_n\right) = P\left(X_{n+1} = x / X_n = x_n\right).$$

In words, MC is a random process with a discrete set of states, discrete time and of that kind that the probability $p_i(n)$ that at the time moment t_n the process will be in state i, is stochastically dependent only on the state at the previous time moment, i.e. on the state at the time t_{n-1}. Particular realizations x_i are elements of a countable set $S = \{s_i\}$, $i = 1, 2, \ldots, N$ which is called a state space. Behaviour of the described process is determined by:

- the vector of absolute probabilities $p(n)=[p_1(n), p_2(n), \ldots\ldots, p_N(n)]$ for $n = 0, 1, 2, \ldots$, where $p_i(n)$ denotes the probability that the process is at a moment n at a state i.
- the transition probability matrix P which gives conditional probabilities $p_{ij} = P(X_n = s_j / X_{n-1} = s_i)$, where $i = 1, 2, .. N$ and $j = 1, 2, .. N$, where p_{ij} can depend on n. In the case that p_{ij} does not depend on n at all, we speak about homogenous MC, in the opposite case we speak about non-homogenous MC.

If we know the probability of particular states appearance at the time moment when the process starts, we can describe behaviour of the process using the following relations:

$$p(n) = p(n-1)P. \tag{1}$$

and by gradual substitutions we get:

$$p(n) = p(0)P^n. \tag{2}$$

The idea of MCA application on stock markets is not new. We can gain some information for example from Doubleday and Esunge [2], Vasanthi et al. [7], or Zhang and Zhang [8]. However, those studies concentrate only on share indexes and a state space is defined only from the daily change size. On the contrary, in this study we have concentrated on selected shares and we analyse possibilities of MCA usage for TA indicators construction. It means we intend to define such a state space in which it is possible to predict with good reliability whether the trend will remain or change.

1. Data

The study is based on the data from the Prague Stock Exchange in the space of 7 years from 2 January 2006 until 2 January 2010, specifically for the close daily prices of the following

shares: ČEZ, Komerční Banka and Telefonica O2. In the monitored period of time the mentioned companies regularly paid out the dividends. For this reason the close prices on the Ex date have been increased by a dividend. In this way the price drop, caused by the loss of dividend claim, has been eliminated. Out of these modified close prices we have calculated the share price daily change y_t and the share price cumulated change k_t for a certain period of time. The length of the time period has been determined by the number of growing or decreasing close prices in sequence according to the relations:

$$y_t = \frac{P_t - P_{t-1}}{P_{t-1}}. \tag{3}$$

$$K_t = K_{t-1}\frac{P_t}{P_{t-1}}, \text{ if } \left(P_{t-2} \le P_{t-1} \le P_t\right) \text{ or } \left(P_{t-2} \ge P_{t-1} \ge P_t\right)$$
$$K_t = \frac{P_t}{P_{t-1}} \text{ otherwise.} \tag{4}$$

$$k_t = K_t - 1 \tag{5}$$

Tab. 1 Example – calculation of y_t and k_t

t	1	2	3	4	5	6	7	8	9
P_t	801.2	809.0	813.7	807.5	802.1	819.0	826.0	834.0	821.0
y_t		0.0097	0.0058	-0.0076	-0.0067	0.0211	0.0085	0.0097	-0.0156
K_t		1.0097	1.0156	0.9924	0.9857	1.0211	1.0298	1.0398	0.9844
k_t		0.0097	0.0156	-0.0076	-0.0143	0.0211	0.0298	0.0398	-0.0156

Source: own

2. Models

Three models are going to be shown in the following part of the study. In each model we will define a state space with eight states. Four states are defined for the cases when the share price decreases *{D4, D3, D2, D1}*. D_4 denotes the highest decrease and D_1 the lowest one. Four states are defined for the cases when the share price grows *{G1, G2, G3, G4}*. G_1 denotes the lowest growth and G_4 the highest one. The size of growth or decrease will be defined for each share according to standard deviation (denoted σ), which is calculated out of daily price changes y_t. For particular titles we have calculated the following figures: $\sigma_{O2} = 0.01442$, $\sigma_{CEZ} = 0.01996$, $\sigma_{KB} = 0.02355$. In each model we will determine the number of particular states appearance n_i, conditional transition probability between particular states p_{ij} and conditional probability of decrease $d_i = \sum_{j=1}^{4} p_{ij}$ and growth $g_i = \sum_{j=5}^{8} p_{ij}$. We have implemented an application for VBA in MS Excel for our calculations.

2.1 Model 1

In model 1 the state space is defined for a daily changes size y_t. We have chosen 0.5σ for an interval width for values categorization y_t. We define particular states as follows:

$$D_4: y_t < -1.5\sigma, \quad D_3: -1.5\sigma \le y_t < -1\sigma, \quad D_2: -1\sigma \le y_t < -0.5\sigma, \quad D_1: -0.5\sigma \le y_t < 0,$$
$$G_1: 0 \le y_t < 0.5\sigma, \quad G_2: 0.5\sigma \le y_t < 1\sigma, \quad G_3: 1\sigma \le y_t < 1.5\sigma, \quad G_4: 1.5\sigma \le y_t. \tag{6}$$

The results for model 1 are in Table 2. Calculated probabilities p_{ij} are in all models shown with three decimal places, therefore the row sum of probabilities does not have to be equal to 1.

Tab. 2 Results for model 1

n-1 \ *n*		D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4	d_i	g_i	n_i
D_4	O2	0.139	0.101	0.139	0.127	0.101	0.038	0.152	0.203	0.506	0.494	79
	CEZ	0.165	0.051	0.139	0.152	0.177	0.063	0.076	0.177	0.506	0.494	79
	KB	0.139	0.089	0.101	0.190	0.127	0.165	0.051	0.139	0.519	0.481	79
D_3	O2	0.079	0.059	0.119	0.168	0.327	0.139	0.059	0.050	0.426	0.574	101
	CEZ	0.108	0.075	0.097	0.140	0.226	0.118	0.129	0.108	0.419	0.581	93
	KB	0.089	0.069	0.188	0.168	0.218	0.149	0.059	0.059	0.515	0.485	101
D_2	O2	0.041	0.041	0.165	0.230	0.284	0.132	0.074	0.033	0.477	0.523	243
	CEZ	0.049	0.057	0.150	0.207	0.289	0.175	0.045	0.028	0.463	0.537	246
	KB	0.053	0.061	0.132	0.268	0.246	0.132	0.075	0.035	0.513	0.487	228
D_1	O2	0.037	0.068	0.141	0.239	0.312	0.129	0.041	0.032	0.485	0.515	410
	CEZ	0.027	0.034	0.143	0.263	0.314	0.145	0.058	0.017	0.466	0.534	414
	KB	0.039	0.059	0.129	0.249	0.308	0.120	0.048	0.048	0.476	0.524	441
G_1	O2	0.033	0.049	0.124	0.274	0.329	0.118	0.037	0.035	0.480	0.520	508
	CEZ	0.029	0.060	0.156	0.235	0.296	0.163	0.045	0.016	0.479	0.521	486
	KB	0.022	0.043	0.110	0.300	0.337	0.116	0.049	0.024	0.475	0.525	493
G_2	O2	0.034	0.060	0.149	0.226	0.285	0.153	0.068	0.026	0.468	0.532	235
	CEZ	0.034	0.034	0.117	0.301	0.274	0.162	0.045	0.034	0.485	0.515	266
	KB	0.036	0.063	0.129	0.263	0.277	0.129	0.058	0.045	0.491	0.509	224
G_3	O2	0.039	0.049	0.098	0.225	0.255	0.206	0.098	0.029	0.412	0.588	102
	CEZ	0.030	0.040	0.149	0.238	0.248	0.139	0.079	0.079	0.455	0.545	101
	KB	0.029	0.049	0.167	0.176	0.245	0.147	0.098	0.088	0.422	0.578	102
G_4	O2	0.074	0.062	0.173	0.173	0.123	0.185	0.049	0.160	0.481	0.519	81
	CEZ	0.095	0.162	0.108	0.149	0.122	0.135	0.081	0.149	0.514	0.486	74
	KB	0.088	0.077	0.154	0.143	0.176	0.121	0.088	0.154	0.462	0.538	91

Source: own

The results show that probabilities of transition from particular states to growth or decrease range mainly between the values 0.46 and 0.54. It means that continuing in a trend or a change of a trend is more or less of the same probability. Such values are from the TA point of view not interesting. Other multiples of standard deviation when defining a state space have been also applied. However, the results were similar.

2.2 Model 2

In model 2 we define a state space for a cumulative changes size k_t. First we were looking for a convenient interval width for value categorization k_t. Gradually we were choosing the width from 0.5σ to 1.5σ with step 0.1σ. The best results, even with regard to model 3 which is a modification of model 2, were for the interval width 0.9σ. Particular states are given by:

$$D_4: k_t < -2.7\sigma, \quad D_3: -2.7\sigma \le k_t < -1.8\sigma, \quad D_2: -1.8\sigma \le k_t < -0.9\sigma, \quad D_1: -0.9\sigma \le k_t < 0,$$
$$G_1: 0 \le k_t < 0.9\sigma, \quad G_2: 0.9\sigma \le k_t < 1.8\sigma, \quad G_3: 1.8\sigma \le k_t < 2.7\sigma, \quad G_4: 2.7\sigma \le k_t. \tag{7}$$

It is obvious that by the way k_t is defined, transitions between some states are impossible. In these states the result is zero without decimals.

Tab. 3 Results for model 2

n-1 \ *n*		D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4	d_i	g_i	*n*
D_4	O2	0.527	0	0	0	0.237	0.151	0.032	0.054	0.527	0.473	93
	CEZ	0.407	0	0	0	0.173	0.309	0.062	0.049	0.407	0.593	81
	KB	0.458	0	0	0	0.277	0.120	0.060	0.084	0.458	0.542	83
D_3	O2	0.228	0.218	0	0	0.347	0.149	0.040	0.020	0.446	0.554	101
	CEZ	0.234	0.169	0	0	0.455	0.104	0.039	0.000	0.403	0.597	77
	KB	0.248	0.248	0	0	0.312	0.119	0.064	0.009	0.495	0.505	109
D_2	O2	0.067	0.184	0.256	0	0.381	0.103	0.000	0.009	0.507	0.493	223
	CEZ	0.084	0.169	0.232	0	0.397	0.097	0.013	0.008	0.485	0.515	237
	KB	0.059	0.247	0.219	0	0.342	0.096	0.027	0.009	0.525	0.475	219
D_1	O2	0.004	0.051	0.200	0.273	0.376	0.078	0.018	0.000	0.529	0.471	450
	CEZ	0.009	0.027	0.212	0.263	0.416	0.071	0.002	0.000	0.511	0.489	452
	KB	0.002	0.005	0.070	0.406	0.278	0.193	0.026	0.021	0.483	0.517	431
G_1	O2	0.007	0.009	0.073	0.374	0.292	0.196	0.048	0.002	0.462	0.538	439
	CEZ	0.002	0.016	0.073	0.374	0.246	0.253	0.027	0.009	0.465	0.535	439
	KB	0.002	0.005	0.070	0.406	0.278	0.193	0.026	0.021	0.483	0.517	431
G_2	O2	0.004	0.013	0.092	0.362	0	0.240	0.227	0.061	0.472	0.528	229
	CEZ	0.004	0.007	0.089	0.375	0	0.260	0.201	0.063	0.476	0.524	269
	KB	0.000	0.000	0.097	0.344	0	0.304	0.198	0.057	0.441	0.559	227
G_3	O2	0.000	0.017	0.059	0.403	0	0	0.261	0.261	0.479	0.521	119
	CEZ	0.010	0.010	0.092	0.398	0	0	0.204	0.286	0.510	0.490	98
	KB	0.010	0.010	0.076	0.390	0	0	0.267	0.248	0.486	0.514	105
G_4	O2	0.000	0.057	0.152	0.305	0	0	0	0.486	0.514	0.486	105
	CEZ	0.028	0.019	0.198	0.274	0	0	0	0.481	0.519	0.481	106
	KB	0.000	0.047	0.133	0.305	0	0	0	0.516	0.484	0.516	128

Source: own

The results of model 2 are similar to the results of model 1. Probabilities of transition from each state to growth or decrease range mainly between values 0.46 and 0.54. Model 2 does not seem to be from TA point of view perspective.

2.3 Model 3

Model 3 is patterned on model 2. There is a state space defined as in model 2, but we will filter the obtained chain. Filtering means omitting the same states repeated in sequence. Let show a chain before filtering: $D_2\ D_3\ D_3\ G_1\ G_1\ G_1\ G_2\ D_1\ D_1\ G_2$ and after filtering: $D_2\ D_3\ G_1\ G_2\ D_1\ G_2$. The results after filtering are shown in Table 4.

According to the results, model 3 seems to be the most perspective considering the TA applicability. After filtering the subsequently repeated states (there have been left those ones where the biggest change is accumulated) the trend change probability is approximately 0.66 and trend remaining probability is approximately 0.34. If we

considered these states as trend changes indicators in TA, we would be successful in prediction in two cases out of three. It is better in comparison with model 2, which model 3 is based on. Having better results in model 3 comparing to model 2 we conclude that the longer the trend lasts the more probable the trend change is. And from the previous conclusion we could also assume that the trend change probability in the state D3 (G3) should be bigger than the trend change probability in the state D2 (G2) and this one should be bigger than the trend change probability in the state D1 (G1). However, the results show that this does not happen; some progress can be seen only in state D3 where the highest trend change probability is. This phenomenon could be explained by the assumption that MC behaviour is dependent on time. This confirms a well known fact that daily financial time rows have a relatively high and changeable variability. Model 3 shows a possible way when constructing MC models for TA. Whether this way is going to be successful, other research will show.

Tab. 4 Results for model 3

n-1 \ *n*		D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4	d_i	g_i	*n*
D_4	O2	0	0	0	0	0.500	0.318	0.068	0.114	0	1	44
	CEZ	0	0	0	0	0.292	0.521	0.104	0.083	0	1	48
	KB	0	0	0	0	0.511	0.222	0.111	0.156	0	1	45
D_3	O2	0.291	0	0	0	0.443	0.190	0.051	0.025	0.291	0.709	79
	CEZ	0.281	0	0	0	0.547	0.125	0.047	0.000	0.281	0.719	64
	KB	0.329	0	0	0	0.415	0.159	0.085	0.012	0.329	0.671	82
D_2	O2	0.090	0.247	0	0	0.512	0.139	0.000	0.012	0.337	0.663	166
	CEZ	0.110	0.220	0	0	0.516	0.126	0.016	0.011	0.330	0.670	182
	KB	0.076	0.316	0	0	0.439	0.123	0.035	0.012	0.392	0.608	171
D_1	O2	0.006	0.070	0.275	0	0.517	0.107	0.024	0.000	0.352	0.648	327
	CEZ	0.012	0.036	0.288	0	0.565	0.096	0.003	0.000	0.336	0.664	333
	KB	0.009	0.057	0.282	0	0.535	0.096	0.009	0.012	0.348	0.652	333
G_1	O2	0.010	0.013	0.103	0.527	0	0.277	0.068	0.003	0.653	0.347	311
	CEZ	0.003	0.021	0.097	0.495	0	0.335	0.036	0.012	0.616	0.384	331
	KB	0.003	0.006	0.096	0.563	0	0.267	0.035	0.029	0.669	0.331	311
G_2	O2	0.006	0.017	0.121	0.477	0	0	0.299	0.080	0.621	0.379	174
	CEZ	0.005	0.010	0.121	0.508	0	0	0.271	0.085	0.643	0.357	199
	KB	0.000	0.000	0.139	0.494	0	0	0.285	0.082	0.633	0.367	158
G_3	O2	0.000	0.023	0.080	0.545	0	0	0	0.352	0.648	0.352	88
	CEZ	0.013	0.013	0.115	0.500	0	0	0	0.359	0.641	0.359	78
	KB	0.013	0.013	0.104	0.532	0	0	0	0.338	0.662	0.338	77
G_4	O2	0.000	0.111	0.296	0.593	0	0	0	0	1	0	54
	CEZ	0.055	0.036	0.382	0.527	0	0	0	0	1	0	55
	KB	0.000	0.097	0.274	0.629	0	0	0	0	1	0	62

Source: own

Conclusion

The aim of this study has been to analyse usage of MC models for construction of TA indicators. We have been looking for such definition of a state space in which it is possible for merchants to predict remaining or a change of a trend with good reliability. For this purpose three models based on homogeneous MCA have been designed and discussed. Out of these three models the most promising seems to be model 3 where the

state space has been defined on filtered cumulated price changes. Whether this process finds application in TA, a following research will show. Other research will be concentrated on the following areas:

- construction of non-homogeneous MC
- other state space defining (a bigger number of states, non-equidistant intervals, etc.)
- construction and empirical evaluation of TA indicators.

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Strategic Directions in the Business Flexibility: Evidence from SMEs in the Czech Republic

Abstract

The main goal of this paper is to deal with the question of strategy making in area of small businesses. In this context, the study provides an analysis of theoretical literature sources in area of strategy evaluation and possible measurement of success. Therefore, an analysis of the strategic flexibility of small and medium-sized businesses could help to find an answer to the question of how this business segment could deal with challenges from the external environment and what type of strategies they might use to achieve their goals. Flexibility to changing conditions is a necessary feature of any company in order to be able to respond. Hence, even if the number of jobs provided by the SMEs gazelles or the amount of the value they add does make up a considerable part of a region or sector, attempts to assess the impact of new business formation on development should try to account for indirect effects also. The purpose of presented research was to discover the impact of external business environment factors current strategic behaviour in small and medium sized business area. The survey was conducted on SMEs in the Czech Republic in 2011 within own research project. Presented factors incorporate dynamic behaviour and shows how manipulating certain items can alter outcomes in the strategic system in a predicable way. As a contribution to the literature, the paper highlights on the flexibility of business strategy types and which items are the most important for strategy making in an uncertain and turbulent environment.

Key Words

firm behaviour, flexibility, small business, strategy, success, turbulent environment

JEL Classification: M10, M19, L26

Introduction

In the changing world economic environment, characterized by continuous structural changes and enhanced competitive pressures, the importance of small and medium enterprises (SMEs) increased. The sector of small and medium enterprises in the economy has a very important place; it is the driving force of business, growth, innovation and competitiveness. Each adaptation in business is an impulse to change and may cause unexpected behaviour inside or outside the company. The basis of maintaining adaptability to environmental changes, growth, business competitiveness and long-term business growth is the ability of firms to innovate. Just as innovative organizations differ, the innovations itself will be much different from each other (to the extent, nature and novelty). Each sector and strategic directions have different characteristics and priorities – some are sensitive to the scale of production, other to

scientific research or the range or sensitivity to demographic changes. Small firms differ from large for example in access to resources, and must therefore create more supportive relationships and closer approach to creating customer base. Degree of novelty associated with continuous or discontinuous (discontinuous, incremental) innovations will require sensitive and dynamic approach to the organization and management of innovation. Innovations are so enormously different – in size and type (technology, product, marketing, organization), in this case we can say that a positive attitude to changes in the organization of work itself is a factor in business survival changes in the region. We can observe a convergence of two key points [17]:

- Innovation is a process, not a single one-off event or events, and as such must be organized and controlled.
- Factors that determine this process can be influenced (both external threats and sources within the company), and thus affect the result – or the process of innovation can be managed.

1. Strategy performance and business growth

Most of previous studies simply regress the effect of the indicator of new business formation activity on a performance measure with some control variables; however, some studies have applied an explicit production function framework. That also contains indicators for the contribution of other inputs to growth [5]. Monitoring the degree of flexibility can encourage greater creativity and focus on strategic planning and management in small and medium enterprises, which is so often underestimated. Subsequent delay introducing changes could cause major changes in behaviour and may influence the ultimate effectiveness of the strategy [12].

A positive relationship between the regional level of start-ups and subsequent strategic growth was confirmed in several countries like United Kingdom [3], United States [1] and Sweden [9]. But a number of other studies could not identify such a positive relationship between the level of start-ups and regional employment, growth and business strategy [4]. Thus the conditions for consistency of adaptability, innovation and strategy are fulfilled. Without these components, the firm cannot adapt to changes in the regional environment. From knowledge of current modern methods of management and business management services in general it can be inferred that the enterprise can develop an open system that is capable of rapidly adapting to positive and negative external influences such as special tax treatment at the employee level with non-deductible impact at corporate level [7].

2. Research methodology

The main focus of the research project was a questionnaire survey in order to describe the ability to adapt business, particularly in the SME sector to the current economic-political-social changes related to the economic crisis. It focuses on the elasticity of the

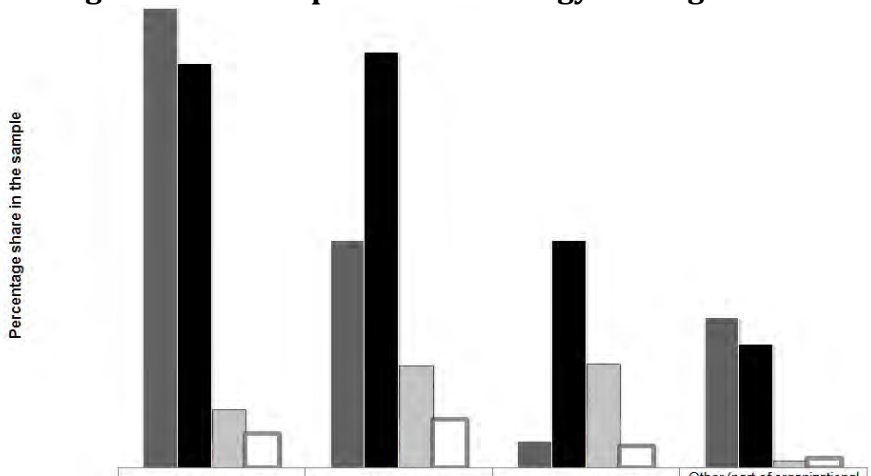
proceedings that were not quantified in the theoretical literature. Quantification of elasticity 2005 – 2010 management is a challenge for this project. The flexibility of management will be monitored particularly in the areas of: crisis and risk management, strategic and project management, personnel policy, production and services and innovation activities, drawing on subsidies, energy savings and renewable sources. Data obtained from questionnaires (663 companies) will be analyzed through the SPSS statistical packet program. the applicability of data was examined by Bartlett's test of sphericity with the values of the presented results being under $P<0.05$ and for all of the data we used the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) with a recommended minimum value of 0.6 [18].

Companies was divided by size (self employed – 13 %, upto 20 – 50.7 %, 21 to 50 – 16.6., 51 to 100 – 7.8 %, 101 to 250 – 5.1 % and more than 250 – 6.8 %). The sample included companies with at least ten years in acting on the market, which has a high explanatory value of his position (companies up to 10 years 31 % 10 – 15 years – 30 % over 15 years – 38 %). It can be assumed that this is a company with good background and strong management that keeps the company in good shape, so that it has practical experience in terms of managing changes in regional structure.

3. Results and Discussion

According to the literature review, the first part of the flexibility analysis is dedicated to *forming a strategy document in relationship to the legal form of the business*. Does a relationship between these items really exist? Did the crisis period change the behaviour of business minds? Businesses, though not specified, really use written form, at least in the form of a summary. By adding up the two versions of a document, a research question is not confirmed. If we hesitated about what a non-written form and brevity is, we would have to ask them more specifically (see Figure 1).

Fig. 1 Relationship between strategy and legal form



	Without written form	Written,Brief	Written,detailed	Other (part of organizational culture)
Self employed	19,0	9,4	1,1	6,2
Ltd.	16,7	17,2	9,4	5,1
JSC	2,4	4,2	4,3	0,3
Other	1,4	2,0	0,9	0,4

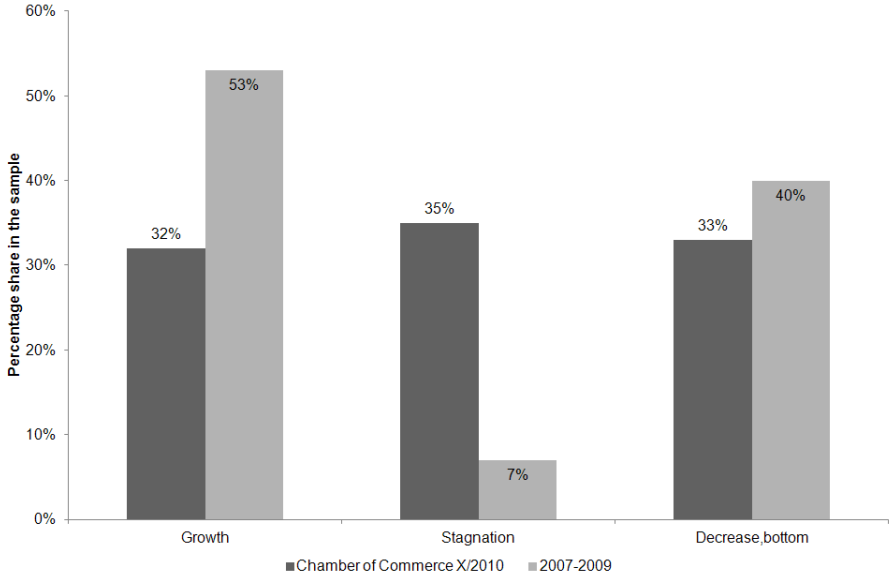
Source: own research

Businesses, though not specified, use really a written form (48.5 %), at least in a summary form (brief, 32.8 % in sample). Partial analysis shows that the strategy in document of not written form prevails among self employed, with the growing size of the business, plan must be at least partly formalized in writing form as necessary step of business development.

Second step of the survey was to answer the question of strategy flexibility on changing business conditions. The time delay is an obvious reaction to the crisis that came, also meaning that if there is confusion between strategic and operational management, problems and difficulties are addressed immediately so that not so major crises could occur from a business perspective. By contrast, in September 2008 when the crisis started knocking at the door of the global economy, change in economic development was negatively expressed by only 9.1 % of enterprises in survey provided by Chamber of Commerce. If we evaluate both studies, our sample is somewhat more optimistic, but still follows the general crisis trend. The barometer survey, which is made annually by the Chamber of Commerce, included, inter alia, assessments of the economic situation and was compared with our results, from 2010 (see Figure 2).

This trend corresponds to the development of personnel policies, which mirrors the result of questions about the phase of the business cycle, when 46 % of companies interviewed had not registered any change in the four-year period, only 26 % of companies had dismissed up to 30 % of their employees and only 3 % of firms laid off more than 30 % of their employees. In contrast, it showed us that 25 % of companies in "crisis" took on other employees. By comparison, we obtained the different reaction in the “decrease” period (see comparison 33 % to 40 % in Figure 2). On the other hand, the evaluation of the growth stage was really postponed (see reactions in Figure 2). This situation corresponds with the analysis of the business cycle in the mentioned period, when the value added in the productivity of labour got into problems in the end of 2009 [14].

Fig. 2 Evaluation of current business stage



Source: own research,[13]

Therefore, there is the final strategic performance dilemma. Why in the absence of a long-term strategic document do many of these businesses not only survive, but also mention undergoing development? As can be seen from the investigations carried out, it was only the high level of adaptability (annual plans), employee participation in business operations and a strong corporate culture that saved them. Finally, we made a factor analysis to find significant items as sources of flexibility (see Table 1). The flexibility in an uncertain environment is determined particularly by the mission and vision of the company, which was created by the business owner or management board. The dynamic behaviour is connected with all of the factors from the questionnaire. We used the multi-stage factorial analysis. In three step modelling we obtained the appropriate combination of factors (in each step the factors with a VARIMAX rotation under 0.6 were deleted) The KMO test was still above 0.6 (KMO_1= 0.712 KMO_2=0.67), factors, which were obtained were four (table 1).

Tab. 1 Component Matrix Values

	Factor loading	
Turnover 2005 – 2010	0.885	**F1 –Financial performance**
Profit 2005 – 2010	0.885	
Risk Analysis	0.792	**F2 –Risk and crisis management**
Crisis Plan 2005 – 2010	0.838	
Practical Use of Crisis plan	0.659	
Percentage of Turnover for Innovation 2005 – 2010	0.754	**F3 – Investment for innovations**
Percentage of Turnover for R&D 2005 – 2010	0.747	
Grants and Supporting Programs from EU	0.631	**F4 –Project management**
Partner or Subject in projects	0.735	

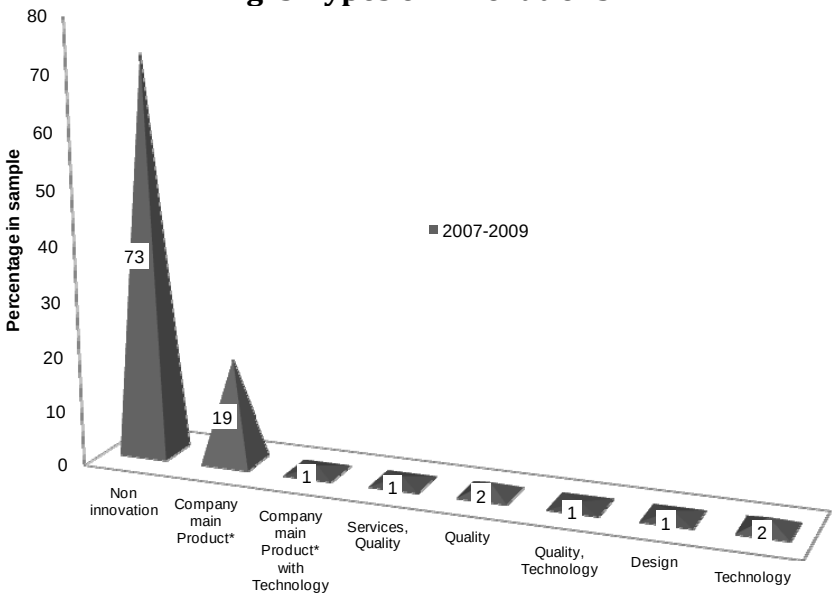
Note: Extraction Method: Principal Component Analysis.p=.000; Chi-Square 1942.48 df=36; sig.0.00.

Source: own research

In a small part of the research sample we discovered the contrasting effects of their strategy. They mentioned growth and innovation and yet in the area financial they made losses due to inappropriate managerial methods like quality standards [15].

The final part of the research was focused on whether the company behaviour in the situation compared to the path of innovation. Following the innovative activity the causal chain was investigated – investment in innovation activities, type of innovation or receiving projects from European funds (see table 1, factor F3, F4). Most companies surveyed (33 %) reported that they hardly innovate, because they invest in innovation less than 1 % of turnover. The close linkage of the respondents reported 32 % of firms that innovate and pay only a minimum of 1 to 5 % of turnover. Less than a quarter said that investing in innovation 5 to 10 % of its turnover. Only 15 % of firms invest in innovative activities more than 10 % of turnover (see Figure 3).

Fig. 3 Types of Innovations



Source: own research

As shown in the Figure 3 above, to the greatest extent during the crisis period they did not innovate. The results thus showed that most firms innovate in the product or service itself. Learning organization as a service concept and product innovation was found in 19 % of most companies (innovation as a whole). Hit a part of innovative strategy could be the most important thing that drags on business forward in crisis times, which only 8 % of businesses reached. Adaptability factors clearly support the sort of change in the organization or changes in strategy, which develops incentive for the management of the innovation process. The supporting results (not depended on period 2005 – 2010, only innovation made during the period of business provided) thus showed that most firms innovate in product itself, this type of most frequent innovation reported 27.18 % of firms. In close pursuit, 24.36 % of companies reported that mostly innovate the processes and technology. Learning organization (12.1 %) and a marketing concept and innovation were found in 13.07 % of most companies and in the last position were strategic innovations with 5.48 %. If we compare it with other results, we can come to this causal innovative strategy relationship:

- *Adaptable* business is the one that recorded in the crisis the phase of growth (53 % in sample), **or** belonged to the group, where it invested in innovations more than 10 % of turnover, the end point represents 5 % of turnover as the ideal value for this sample.
- In contrast, the *stagnation* experienced firms that invest in innovation between 1-5 % of their turnover; in fact, they were in the lower half of the span.
- *Decrease* in total and the crisis was experienced in business enterprises that invest in innovations less than 1 % of their turnover.
- As shown in the Figure 3, to the greatest extent during the crisis period they benefited from the investments that are induced by grants and EU funds what was supported by factor analysis in the table 1. So, share of 63.8 % of companies did not have support from investor (EU grants) and did not innovate during crisis period. Others mostly received 1 million CZK in average (21.7 %).

Conclusion

Companies which developed a plan or were innovation-oriented during unstable economic conditions were more dynamic in their behaviour and were proactive in their strategy development as opposed to being merely reactive [16]. They created value for the company even during dire times for businesses. Secondly, factors, which generate sustainability in the long term period, should be evaluated as a supporting decision making tool, because they create a long-term competitive advantage in business. In line with our analysis, we supported the fact that innovations, made in a non-stable economic environment were risky and slowed down the flexibility of strategy implementation. Double changes, such as changes in innovations (in processes, services – as a part of a plan) and operative changes in strategy such as the reaction towards impulses from the external environment, speed up the growth of the risk rate. All of our work is limited by the intervals of company evaluation and the availability of data which is a common problem among other studies [19], but further research must be conducted to improve the quality and predictive power of the presented models to avoid bias. The practical value of the non-financial information regarding the correlation between significant factors for business success within social innovation implementation is very important for predicting and evaluating current and potential situations and would be helpful when working with the causalities of failures in the business sector, because each innovation process needs a good business plan and must be evaluated [2].

Acknowledgements

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Research of University Image

Abstract

The article deals with the concept of a university image which is currently gaining importance in the context of a school self – evaluation and escalation of the competitive environment in the tertiary education. The author first defines the concept of image based on the definitions of corporate identity, corporate communication, corporate culture and design. Furthermore, it defines school image specificities, especially a university. University image may become one of the decisive factors in the decision-making process of applicants for studies, leads to other clients' willingness to cooperate with the school and influences employees´ loyalty to a university. The article describes the theory of image research and its methodological procedures. The method of image analysis using the techniques of simplified semantic differential – polarity profile that captures the subjective feelings of the respondent is presented in more detail. The author presents the methodology and results of the research of image that was made for the needs of the Faculty of Economics, Technical University of Liberec, within the years 2007 – 2013. Findings from the research are captured by the individual curves of semantic differential. Specific recommendations for the management of the Faculty of Economics, Technical University of Liberec are deduced from the findings of the three surveys. The author reflects on what can the image analysis bring to a university in general and to a surveyed faculty specifically. The article concludes with the indicated importance of university image for various interest groups, potential and current students, staff, alumni, companies working with a university and employing graduates of the school. If the faculty wants to survive in the competition, it must inform public of how good its study programme is, how high level of academic workers there is, what prospective employment can its graduates obtain, what other conditions its students have.

Key Words

identity, image, marketing communication, university, image research

JEL Classification: M31

Introduction

Universities need to inform the public about an offer of a training program, persuade target groups to cooperate, to remind them of their existence. In connection with the modern approach of school management, marketing communication of universities is based on relationships with stakeholders and target groups. The terms such as identity of school, school image, its good name, reputation and school brand have only come into focus in recent years in the Czech Republic. In practice, however, these concepts are not often well comprehended; their importance for school is not always appreciated.

1. University image

The term "image" became the most popular in the 50´s of the 20th century in the USA. The original meaning of the word comes from the Latin language (imago = image). Nowadays, the term is used in marketing in connection with company image, brand image, etc.

The conception of the university image can be mainly found in works of Eger and Egerová [1],[2], Světlík [3] and Jakubíková [4]. The application of this concept into practice, however, often encounters the problem between different types of specialized terminology and problems in definitions. The concept of image has been formulated for the purpose of marketing in connection with the theory of corporate communication in a profit sector and is related with concepts of corporate identity, communication, culture and design.

1.1 Theory of corporate identity and image

Corporate Identity is a personification of a company derived from its philosophy, history, culture, strategy, environment, management style, reputation and behaviour of the company representatives. It shows how the organization communicates inside and how it is presented on the outside. Corporate identity expresses how the company understands itself, how distinct it is from its competitors.

In theory, the concept of corporate identity consists of the following elements:

- **Corporate Design** – coordinated setting of visual elements, i.e. logotype, brand, script, colours, uniform layout of documents, forms, publications and promotional materials, appearance and uniforms, protective clothing of workers, product design and packaging, architecture, the buildings and surroundings, etc.
- **Corporate Culture –** summary of ideas, attitudes and values widely shared within the company and relatively long maintained, i.e. long-term and current climate in the company, management level, relations in the organization, values and motivation scale, customs, rituals and ceremonies, puns, stories, etc.
- **Corporate Communication** – summary of all methods and means of communication within the company and externally. It covers all corporate communication actions outside and inside. [5]

The effect of these elements creates a corporate identity. Many of them are qualitative variables that can not be precisely evaluated, quantified and measured. These factors affect human consciousness and sub consciousness and are manifested in them.

Corporate Image is seen as a reflection of corporate identity which is spread about the company based on the perspective and interests of target groups, i.e. from the outside. Image determines whether the company appears to be good or bad. Therefore, the company's image means how the company is perceived by the environment. The

identity of the company creates an image and the image is a reflection of an identity in the perception of interest groups. Image can be written as a formula:

$$(CD + CC + CI) \cdot CCom = CIm, \quad (1)$$

where the components represent: *CD* = Corporate design, *CC* = Corporate culture, *CI* = Corporate identity, *CCom* = Corporate communications, *CIm* = Corporate image [6].

1.2 Specificities of image in tertiary education

School image is the sum of all ideas, knowledge and expectations associated with the given educational body. For defining image of a school there is a definition by Jakubíková [4]: The image of the organization (school) is shaped by its identity, culture and interior design which are distributed both inwards and outwards through communication channels of a school.

Image of a university as an educational entity is, therefore, determined by a large number of external and internal factors. It is part of a higher order structures, such as the image of a region, nation. At the same time, it is connected with previous school activities and how it was perceived in the past. Thus, it depends on many factors and the image of education in the society is also influenced. School image is relatively stable, and therefore it can not be quickly changed. The fact that people may not always accurately understand the current situation in a particular school must also be taken into account.

Most of the mentioned authors agree that the school image is composed of objective and subjective, of good and bad ideas, attitudes, experience of individuals and groups of people of a particular school or educational program. Eger, Egerová [1] in accordance with Štefko [11] emphasize that the image of a university is related not only with the quality of educational services, but also with teachers and students, with current and former graduates and their supposed knowledge. It should be noted that even university graduates take overe its image.

School image is one of the decisive factors in the decision-making process of applicants for studies. Future employer choosing between two qualified graduates with a similar education and similar personality traits and experience will probably prefer a graduate from school with a better image.

School image is also linked with the willingness of other parties to cooperate with the school. Good image of a university can lead to the acquisition of necessary financial resources for school development, for building lasting relationships with companies in the field of cooperation with foreign and domestic universities.

Employees are also positively influenced by good image, which leads to their loyalty. School image can be severely damaged by criticism of school by academic workers.

2. Research of university image

When creating an image of a university, it is necessary to see how stakeholders view the school, what their ideas are about the school and what they expect. The research provides a basis for image enhancement or possible change of image. By examining the image, it can be also determined what position a university has in comparison with the competition. Any school always has a kind of image. Therefore, its management should analyze the existing image among various interest groups, identify its weak points and then improve the current image. Image analysis is a complex process. Image is formed by the subjective perception of the characteristics of an institution by different groups of respondents. School image is also influenced by the objective characteristics of the school (the building and its surroundings, equipment, etc.), some of which can be changed with a difficulty or only at high costs. Image can be at least partially determined by appropriately selected research. Current image of an educational institution is usually based on its previous reputation and has a relative stability. Therefore, it is necessary to take into account the fact that a number of factors can be changed only by long-term and patient work. In practice, some views can even be removed from the current reality [13].

2.1 Image research theory

Standard image analysis method does not exist, methodological procedures are chosen according to the research objectives. Světlík [9] and Vysekalová [6] suggest the following to measure image: semantic differential, multi-factor method to compare schools with competing schools, measuring familiarity and favorability of attitudes towards the institution and multidimensional analytic map. Kotler [10] mentions the first two methods. Eger, Egerová [1] also recommend these methods given the usual options of schools.

Image analysis method with help of a polarity profile captures the respondent's subjective feelings using bipolar rating scale, and is therefore suitable for an area of education. This method is suitable for more detailed analysis of the content of the image of schools. The results are clearly expressed in a graphical form. In practice, there is good experience with this method. This technique measures the image of the institution on the basis of the so-called relevant dimensions. The image indicators are based on the dimensions people use to describe the observed object. At the beginning, the variables that influence the image making are defined according to the answers to questions that evaluate the given school. Furthermore, there will also be construction of bipolar scales by which we evaluate characteristics of the studied phenomenon [2]. A series of contradictory conceptual pairs is set, the selection of bipolar adjectives is given by the aim of investigation. Contrasting pairs of terms are arranged on a seven or five-point scale [12].

When the method of analysis by a simplified form of semantic differential technique is applied – by a polarity profile – a numerical scale is used. The method is ranked on the border between direct and indirect methods of questioning. The selection of properties (usually 15) is performed according to the purpose for which the phenomenon is studied. Three main groups of factors are applied in the classic test including:

- evaluation factors (good – bad)
- potency factors (strong – weak),
- activity factors (executive – inefficient).

After the carried out research, the answers to individual items for each group of respondents are averaged and graphically displayed. The resulting vertical line represents a summarized view of the image of the institution. If you follow each group of respondents separately, we can evaluate the difference in assessment of individual groups. If the curve stays in the left half of the prepared scale and the questionnaire, then the image is quality. The following correlation applies here: the more to the left the values of the curve, the more quality the image [1].

2.2 Image research at FE TUL

For the purposes of the Faculty of Economics, Technical University of Liberec (further FE TUL) image research of the faculty was organized four times within years 2007 – 2013 [16]. As a basis for the creation of a questionnaire, there was used innovative version of the pilot questionnaire for the survey of school image prepared for school management education in the Czech Republic [1], according to Eger [8]. The data was taken by written questioning using a single standardized structured questionnaire, which uses a five-point numerical scale with ascending numbers in 15 dimensions (Figure 1 below).

In 2007, the target groups were students of the 4th grade of Business Administration, Insurance, Managerial Economics daily and combined studies at FE TUL, as well as staff and alumni of FE TUL. In the years 2011, 2012, 2013 the target groups were students from the 4th grade of Business Administration, combined studies at FE TUL. To compare the development of image at a time, only students from the 4th grade of Business Administration, combined studies at FE TUL were selected for the above research as respondents. Microsoft Excel spreadsheets were utilized for processing the research and the results were summarized in tables and graphs.

The responses to each item were put in average and graphically displayed. The resulting vertical line represents a summarized view of the image of the institution for this target group.

3. Research results of the faculty image according to students within years 2007 – 2012

3.1 Faculty image according to students

If we look at the results of all these studies (Tab. 1), we can say that the quality of the educational program is consistently rated as slightly above average. The equipment of the faculty between 2007 and 2011 was rated as average, but for the last two years has been marked as obsolete. The atmosphere at the faculty is regarded as friendly, over the years, its rating slightly worsens. The interest in studying at the faculty is perceived as quite high and the success of graduates as exceptionally large. The level of faculty lecturers is seen as slightly above average, however in the last two years, its rating has slightly reduced. Performance of the faculty management is evaluated as average, nevertheless the scientific activity of the lecturers is not that known to respondents. Communication at the faculty is perceived as rather passive, but it is improving in time, the best result was achieved last year. The faculty presentation in public has significantly improved in recent years according to respondents. International relations of the faculty are regarded as relatively strong; however the cooperation with local companies is viewed as worse.

Tab. 1 Image research at FE TUL in the years 2007 – 2013

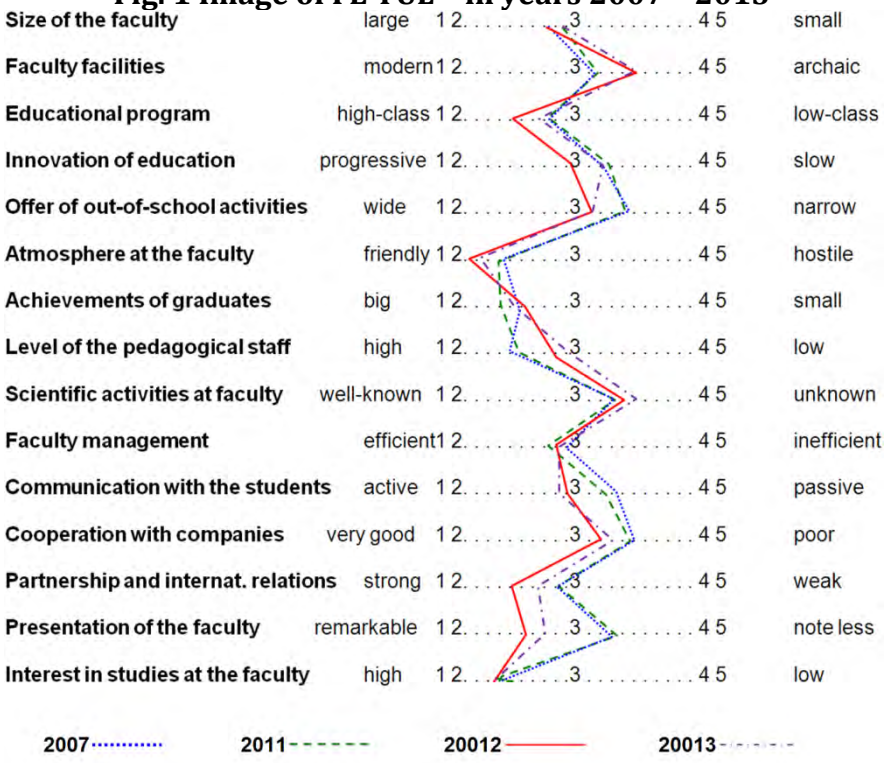
	2007	2011	2012	2013
Size of the faculty	2.7	2.8	2.7	2.8
Faculty facilities	3.1	3.1	3.5	3.5
Educational program	2.7	2.7	2.4	2.6
Innovation of education	3.2	3.2	2.9	3.2
Offer of out-of-school activities	3.4	3.3	3.1	3.1
Atmosphere at the faculty	2.3	2.2	2.0	2.1
Achievements of graduates	2.5	2.4	2.6	2.5
Level of the pedagogical staff	2.6	2.6	2.8	2.9
Scientific activities at the faculty	3.3	3.3	3.4	3.5
Faculty management	2.9	2.8	2.8	2.8
Communication with the students	3.3	3.2	2.9	2.8
Cooperation with companies	3.4	3.4	3.2	3.3
Partnership and international relations	2.8	2.7	2.4	2.6
Presentation of the faculty	3.2	3.2	2.5	2.7
Interest in studies at the faculty	2.3	2.2	2.2	2.2

Source: Author's own research and table

Looking at small deviations of curves of semantic differential (see Figure 1), it is clear that **the image of FE TUL is specific, undispersed**, with small differences in the evaluation of individual factors of image over several years. The image of FE TUL is formed by elements that are perceived similarly in different years. The categories of "size of the faculty," "interest in studying at the faculty" and "success of graduates" show very slight differences over the years, their image has not virtually changed. The largest variance is recorded in "equipment of the faculty" (worsening evaluation in time) and

the perception of "atmosphere at the faculty" (improved evaluation in time). From the location on the curve, on the left of the mean value, it is clear that in all years of the research there occurs a positive evaluation of the "atmosphere at the faculty", "interest in the studies", "success of graduates" and "training programme". The categories of "equipment of the faculty" and "faculty scientific activities" are still negatively considered.

Fig. 1 Image of FE TUL – in years 2007 – 2013



Source: author's own graph

Although the image is made up of subjective and objective characteristics of the faculty perception, it can be at least partially recognized and analyzed. The research has shown that FE TUL image is consistent, that is, it does not differ substantially over the years 2007 – 2013, and it is relatively stable. Negatively rated categories must be constantly monitored and evaluated, as they point out the need to change the existing image of the faculty.

3.2 Recommendations arising from the research

The positive image of the faculty must be continuously and systematically created. Purposeful work on the development of wanted image should be part of the management strategy of any faculty. Image can not be made up at the moment when there is a lack of students due to a fierce competitive struggle. The management together with lecturers must define desired image of the school. Then, based on established definitions and results obtained from a previously published research of image a specific plan in this area should be created. The differences between the image perceived by

target groups and the image required by a management are to be taken into account when developing a strategic plan. It is necessary to make the diagnosis of negative perceptions in specific categories forming the image and to create a plan to minimize them.

The results of the above research show that the management of the FE TUL should make analysis of internal communication, surveys of student satisfaction with the study, satisfaction with study conditions (equipment of the faculty) and meeting students´ expectations from the study (scientific activities of the faculty, cooperation with local companies). The faculty should improve the system of feedback from students, establish regular polling and repeat surveys of the image in the coming years. The image research must be done regularly for other target groups such as employees, graduates and potential and full-time students in all study programmes. Potential students planning to study at the university over a relatively long time, and the financial risks with opportunity costs involved are substantial [17]. To create a positive image of the faculty, it is essential to inform about the plans and activities of the faculty regularly.

Conclusion

Image affects perception, attitudes and behavior of interest groups – both positively and negatively, increases the degree of knowledge and acceptance of the school. Therefore, schools should seek to create and systematically develop a positive image, engage in self-evaluation in the context of strategic planning. Image analysis is always performed whenever the competitive environment intensifies and the position of the organization in new conditions must be clarified. Public colleges often do not want to admit intensifying competition in tertiary education. However, the image of the school can play a significant role during decision making of potential applicants for studies at the university. Consequently, it will be important for the university in the future, not only to gain new students, but also to retain the current students. The increasing number of competitive educational institutions will enable an easier changeover to the competition. The faculty must communicate the difference between their offer and the offer of competitors. It should be noted that the faculty is often judged by its public image rather than by the actual quality. The faculty with better image will raise a greater interest among students and teachers. In tertiary education, it is not just about students' attitude towards school, but also about the opinion that employees have towards their school, government and legislative offices, alumni, local and business community, professional and scientific community, the media and other groups of people. The opinion of these groups is indispensable for the position of a university.

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Evolving Innovation Perspectives on Higher Education and Its Role to Competitiveness

Abstract
Higher institutions play a significant role in the economic development in today´s turbulent environment and in competitive position of regional and global businesses. These institutions have now more than ever the power to stimulate business competitiveness thanks to their ability to foster innovation, attract new businesses, and provide continuous flow of information, knowledge and , last but not least, to improve the workforce. Therefore, these institutions should be seen in the last few years as the agents of a valuable source of innovation and skilled people who can contribute to higher level of local and global competitiveness. It is expected from them to use an innovative approach in their teaching methods and curriculum to ensure more flexibility and creativity for the needs of the business world. However, most of them recognize their unique and essential opportunity to change only very slowly and without any formulation of clear marks to this issue. This article deals with the issues related to the current situation and the role of higher institutions (especially universities), and points out their emerging innovative approach in order to contribute as a significant element to business competitiveness. To better understand the current position it is necessary to prepare an appropriate platform for discussion and research of existing organisational structure, practice barriers of change and suggest their core implementation. The current situation is evaluated according to the results of the empirical researches made by the authors. A special emphasis is placed on the innovative approach in the teaching methods based on the needs of business practice. The goal is not to only present the results, which show undoubtedly a very strong need for change, but also to suggest a possible solution for the improvement of the current situation.

Key Words
innovation, competitiveness, teaching methods, university, business

JEL Classification: I23, O31, M21

Introduction

Higher institutions are now in the position of becoming one of the most important drivers of the economic growth. Especially universities are now strongly expected to contribute to regional business competitiveness at least through the availability of quality research links and supply of well trained graduates [22], [5]. In order to enhance their contribution to competitiveness universities and other higher institutions should

start to conduct comprehensive reviews of their existing teaching models and curriculum. The call for radical change is obvious as confirmed by the example [22], [13], [8].

There is a significant discrepancy between the existing model and the model which is necessary. Taking an example from the universities in the Czech Republic, most of them are still running a "static" model without any notable signs leading to a new system. Right now, it is the highest time for them to become aware of the few obvious facts related directly or indirectly to the contribution of higher education institutions to regional competitiveness [20]. The contribution of broadbased teaching and learning to the enhancement of regional human capital is often neglected. The majority of graduates take up employment in professional services or businesses. *"Some of such regionally based businesses are trading both nationally and internationally and use the skills of graduates to develop new "products", some of which will also be provided to regional high-technology-based businesses."* [22, p. 39]

There is just one possibility for higher institution to make the change and it seems many of them haven not recognised the need for it yet. To face this problem authors asked themselves the question who are the most important stakeholders in this issue. They chose a base of the 3 most important stakeholders: representatives of higher institutions, students and representatives of businesses. As the writers are representatives of such institutions, they are completely aware of the particular problem, and therefore they concentrate on pointing out only some crucial facts about the situation at the higher institutions. Furthermore, they mainly focus on another two groups of stakeholders – students and businesses representatives.

1. Innovation and competitiveness hands in hands

Higher education institutions stand out as potentially important part because they have the ability to form a personality and knowledge base of a future graduate. Services offered by higher education institutions may not generate profits but they do affect the quality of life as well as the level of competitiveness of businesses. Therefore, a well trained graduate presents one of very important impacts to higher competitiveness of regional businesses. However, as globalization has fostered a worldwide market, higher education has to take this fact very seriously and arrange the basis innovation steps which are necessary to be done. Higher education systems, policies, institutions and businesses are being transformed by globalization, which means widening, deepening and speeding up of the worldwide interconnection [14].

In many countries, since 1980s, there has been increasing pressure on higher education to contribute to national competitiveness. Especially in the way of meeting the needs of the economy, i.e. company needs [3], [11]. As [13] or [24] mention the "new reality" in higher education institutions is about responsiveness, not downgrading education to training. The main point of new approach in higher education should be about examination of the nature and implication of organizational, methodical change for graduates and assessment of the attributes which graduates will need in the future.

Make innovation, or die, [4] or as Andrew Groove, one of the founders of Intel Company, pointed out: "*Only the paranoids survive!"* [12]. The success dwells in innovation. Innovation is power for being dynamically competitive. The main source of innovation are unexpected events, clever ideas or just an invention of needs [18]. Innovation in the case of higher education is about invention of needs. Innovative direction must encourage higher education to put in place programmes and teaching methods that develop skills and qualities as well as ensure a sound understanding of the subject matter [17]. Furthermore, in the last few years most companies underwent some quite important changes such as downsizing, making the company organization more leaner, home working, flexible work contracts etc. This all has impacted the graduates in the meaning of new requirements such as better flexibility, team work, quicker understanding of company processes etc. And again it is on the higher education institutions to ensure these qualities.

Innovation and competitiveness have become buzzwords recently. Competitiveness has the ability in today's globalized world to hold businesses, regions and countries "on the safe side". Quality of the offered education and shaping of young people into skilled and capable individuals is the core of success in knowledge-based world which is founded on knowledge and innovation. World Economic Forum (WEF) defines competitiveness on an example of 12 pillars set up as a set of institutions, policies and factors which determine the level of productivity of a country. One of the pillars is higher education and training which is crucial for economies that want to move up the value chain beyond the simple production processes and products [23].

2. Crucial moments and obstacles

"You can´t make an omelette without breaking eggs" [4]. And innovation cannot be done without taking risks. But what is necessary to separate is innovative approach as a core process which must be organized and managed from the beginning. The dramatically changed global competitiveness environment means a lot for higher education. It means that the level in which the higher education contributes to business competitiveness depends not just on the level of input but even more strongly on engaging the people at educational institutions with the outside world, particularly within their own region [2]. In this situation it is crucial to feel the critical moment which is calling for the innovation and chase it. The institutions have just one chance and they should not be late, since the others will be in front of them. Also, it is important to have support from decision makers. Assuming that the above mentioned facts are realized, the other crucial moments are about summarization of what the innovation should be about and what to concentrate on. The most important activity, in relation to arranging higher competitive possibilities thanks to better skilled graduates, is to use new teaching methods and to integrate them into the curriculum with the potential to focus more on the entrepreneurship education [16]. The methods should be built not only on using effective teaching approaches such as group, team techniques, case studies, workshops, business simulation or inviting quest speakers, but on taking the advantage of using knowledge and effective relationships with business praxis. Therefore, entrepreneurship education is significantly important not only in the view of educating

skilled and trained people, who can start-up their own business, but also as a challenge to give people understanding of what running a business and company processes are about [21], [15]. The effort to improve the excellence of higher institutions, universities in the context to better connect theoretical knowledge with practical application is becoming the top priority. This can be achieved only by sophisticated open-mindedness to business world to get knowledge which is needed in order to enhance the competitiveness (mostly of the regional companies who can be in the closest relationship to local institutions).

There are several most important obstacles which the institutions (especially universities) must be aware of. First and the most important is information. They need to get information from the above mentioned stakeholders. It is easier to get information from students than from a private sector. Students´ opinion is shown by the Flash Eurobarometer survey Students and Higher Education Reform [9], in which the respondents were students from 27 member states of the EU, Croatia, Iceland, Norway and Turkey. 90 % of the respondents (89 % of the respondents from the Czech Republic) confirmed that study programmes should include communication skills, teamwork and "learning to learn" techniques, in order to meet the demands of today's workplace. Another interesting result confirmed the mentioned problem, 86 % of the respondents (87 % of the respondents from the Czech Republic) have the proposition that study programmes should focus on teaching specialized knowledge in a given field of study.

While the partnership between institutions and private sector is still a little bit patchy, it seems complicated to get information from the private sector. Despite this fact, there are some informative sources which can be used. From example the Flash Eurobarometer survey Employers ´perception of graduate employability [10] in which the respondents were companies at least with 50 employees and from 27 member states of the EU, as well as Norway, Iceland, Croatia and Turkey. When asked about the skills and capabilities that would be the most important for future higher education graduates, 45 % of the employers selected sector-specific skills and 43 % selected basic capabilities, such as having good numeracy, literacy, computer skills. 87 % of the employers emphasized the importance of new employees having work experience as a crucial asset for them. Another interesting fact is that 56 % of the asked companies had never cooperated with higher education institutions to discuss curriculum design and study programmes. This fact seems as one of the core problems looking also at the information that 48 % of the respondents value the importance of cooperation with such institutions. The second obstacle is to handle the problem of awareness and motivation of higher institutions' staff. Thirdly, it is necessary to provide funding and its sustainability for the innovation. Speaking about the second and third obstacles, the writers can conclude that there is an increasing awareness between the higher institutions and staff about the innovation necessity. Furthermore, the funding options are getting better thanks to the European structural funds, as shown on the examples such as the programmes Inem or Syprom running at the University of West Bohemia, Faculty of Economics.

3. Empirical research

For the evaluation of the current situation in the field of higher education and its role to competitiveness an empirical research by the writers was made. The empirical research is composed of two evaluations, both made during March 2013, using an on-line questionnaire form. The both evaluations contain closed questions which offer closed scale of answers, semi-closed questions which also provide the possibility of "other" as an answer, and open questions which are answered by the respondent himself/herself. The target group of the first evaluation were students of bachelor study programme, since such graduates are the most common workforce with university degree on the market, they represent 62 % of all students on higher education institutions [6]. Also, the bachelor study programmes represent mostly the necessary knowledge base for company praxis [7]. The questionnaire dealt with the opinions of the respondents about their readiness for praxis, the influence of the education acquired at school on their understanding of business praxis, processes, teaching method specification and their evaluation. Together 740 students were asked, when 165 students (22.3 %) answered the questionnaire.

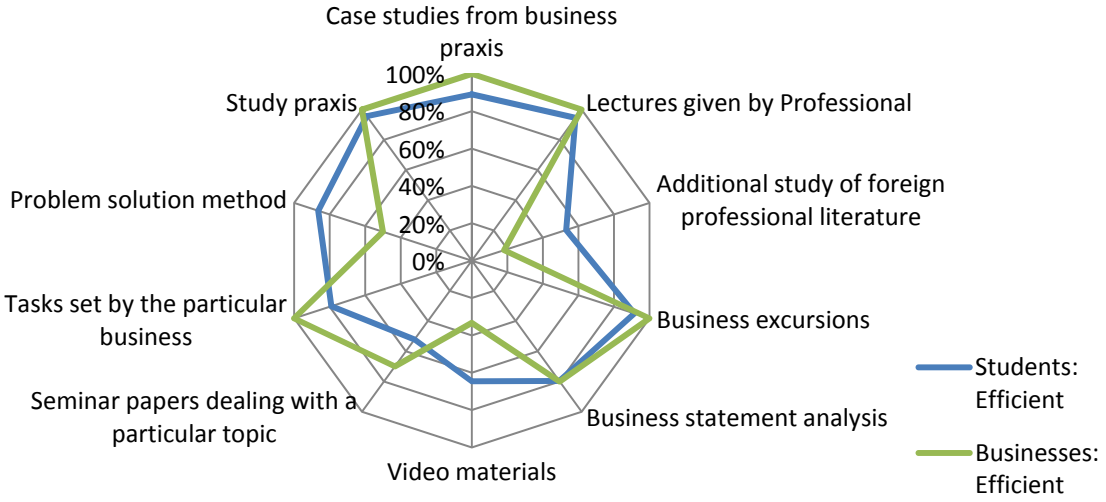
The target group of the second questionnaire research was created by businesses. The questionnaire dealt with opinions of the respondents about the students´ readiness for praxis, identification of possible improvements in their knowledge and skills of the graduates and evaluation of teaching methods efficiency regarding the graduate´s praxis. Together 50 companies were asked, when 11 companies (22 %) answered the questionnaire. The participation in the research is not particularly high but as an additional view on the higher education and its role to competitiveness situation it is sufficient. The students were given the fundamental task to assess the current teaching methods regarding their readiness for their future work market position and the business praxis. Similarly formulated task was also given to the businesses. The results show that 62.4 % of the students think that they are not well prepared for their praxis. This is even enhanced by the business questionnaire results which show that the majority of businesses (72.7 %) considers the students´ readiness insufficient.

Another target was to find out which of the current teaching methods are considered efficient/inefficient by the respondents. Business excursions are considered to be the most efficient (91.5 %), together with lectures given by the professionals from praxis (94.5 %) and the business praxis itself (95.7 %). On the other hand, seminar papers for particular business within the scope of the given issue is considered inefficient by the students (47.9 %) as well as the additional study of foreign professional literature (46.8 %).

Furthermore, it was compared which teaching methods and materials are considered efficient by the students and which by the businesses (see Figure 1). All respondents from both groups chose excursions to businesses as the most efficient, together with already mentioned lectures given by the professionals from praxis and the business praxis itself. Case studies from business praxis and practical tasks set by the businesses directly from their praxis are also seen as very efficient by the businesses as well as the students (89 % of students for case studies and 79 % of students for practical tasks).

However, the problem solution teaching method was not similarly evaluated by the two groups of respondents as 86 % of students marked this method as efficient and 50 % of businesses as inefficient. Controversial is also the efficiency of video materials where 65 % of students understand this method as efficient and 67 % of businesses as inefficient. Nevertheless, the additional study of foreign professional literature is understood as inefficient by the businesses (82 %) which was supported by the student respondents where 46.8 % of students considers this teaching method inefficient.

Fig. 1 Comparison of the teaching methods efficiency from the students´ and businesses´ point of view



Source: own

Importance and beneficiality of study business praxis is supported also by the European Commission, [9] where 86 % of the student respondets consider this teaching method efficient.

With regard to the result that 62.4 % of student respondents do not feel well prepared for their praxis by the current study concept it was further examined whether there could be a connection between the year of study and the opinion of the respondents about the readiness for praxis. For the measurement it was used the $\chi 2$-test of independence which examines the link between given variables, in this case the year of study and the opinion of the respondents about the readiness for praxis. It is tested the agreement of the expected and measured values while the hypothesis H0 is established: the variables in the contingent chart are independent, and H1: the variables in the contingent chart are dependent (there is a connection between them). If H0 is rejected it can be stated that there is a connection between examined variables. For the result analysis a contingent chart was created which enables to test the connection between two categorical variables and shows the measured values and counted expected values (see Tab. 1).

Tab. 1 Measured and expected values

Measured values			
year	**No**	**Yes**	**Total**
1. year	28	30	**58**
2. year	65	25	**90**
3. year	10	7	**17**
Total	103	62	**165**

Expected values			
year	**No**	**Yes**	**Total**
1. year	36.21	21.79	58
2. year	56.18	33.82	90
3. year	10.61	6.39	17
Total	103	62	165

Source: own

Moreover, the test statistics was calculated, the value $\chi 2$ and it was then compared with the critical value $\chi 2$ – division about degrees of freedom $(r-1)\cdot(s-1)$ – in this case the degree of freedom 2 – in the chosen significance level (5 %). The calculated value $\chi 2$ is bigger (8.727) than the chart value (5.9918). H0 is rejected, there was proved the connection between the examined variables, in other words there exists a connection between the year of study and the students´ opinion about their readiness for praxis.

Another target of the questionnaire was to find out the opinion of the businesses about the cooperation with higher education institutions. The results show that 36.4 % of businesses do not cooperate with the higher education institutions. The rest of 63.6 % of business is in cooperation with the higher education institutions, especially in the form of offering study praxis for the students of higher education institutions. 45.5 % of businesses considers the praxis unimportant. It is more important whether the graduate is able to learn new things. 54.5 % of businesses prefer graduates with praxis, no business chose the possibility of preferring graduates without praxis. 45.5 % of businesses consider the acquired higher level education of the economics graduates sufficient for their praxis, 54.5 % of businesses as insufficient from which 9.1 % of businesses as definitely insufficient.

All company respondents agree that higher level of students´ knowledge about the business praxis and processes can mean a particular benefit for the company with regard to the competitiveness when employing this graduate.

4. Factor of success

The innovation can be successful only when it is seen as a strategic goal. The necessary precondition for change is creative, innovative but also critical approach to learning process [19]. The result of the research showed the importance for higher education institutions of being active in cooperation with private sector such as finding and creating suitable and more tailored study programmes which will respond to needs and interest of companies. The lack of quality in teaching methods and approaches in the framework of today's market demands was also confirmed. Among the easiest and the most efficient methods is the method of interactive cooperation with representatives of the business praxis within the university activities. Furthermore, there is also the possibility to show the basic business processes on the simplest examples in the form of case studies or ideally, through study praxis.

Another factor of success is that a wider choice of subject modules should be offered and a regular monitoring of students opinions should be conducted. Also, a significant importance should be given to developing entrepreneurial capacities and mindsets. Sometimes there is a critical view of some experts that education is going to become more a training [1]. The innovative approach should not be about training, but about an effort to become more effective and to create functional relations with the private sector.

A crucial finding is that all respondents from private sectors confirmed that higher level of students´ knowledge about business praxis and processes can be a competitive advantage for the companies. This result unambiguously confirmed a significant influence of higher education institutions on business competitiveness, especially regionally understood.

Conclusion

There is no doubt that innovation, higher education and competitiveness must fit together as pieces of one machine. These institutions are the primary source of the most valuable assets in the knowledge economy – highly educated people and new ideas. The level of competitiveness depends on the interaction between several factors, such as business environment conditions, natural resources, physical infrastructure, policy frameworks and other, still more and more critical factors, such as the availability and quality of educational opportunities. It is important to notice that most of the institutions which have not started with the innovative approach yet, missed their opportunity to be in the position of the first movers. Nevertheless, they can use the advantage of a follower and learn from the mistakes which the first movers made. It is necessary to decrease the level of difference between the knowledge acquired at the higher education institutions and in business sphere (especially the education focused on business establishment and management) so that this synthesis helps to increase the competitiveness of business subjects in the region.

Higher education institutions must do more than simply educate and research, they must engage with others within their regions, provide opportunities for lifelong learning and contribute to the development of knowledge-intensive jobs [22]. This innovative and new approach is the only way to contribute to competitiveness of private sector. If all of this will be at least a little bit performed, all aspects of activities will be impacted – research, teaching, and offered services.

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Financial Literacy: Building a Conceptual Framework

Abstract

Financial literacy is now globally acknowledged as an important element of economic and financial stability and development. Many researchers and organizations focus their efforts on the issues related to its evaluation and improvement. However, in the initial stage of any research an analysed concept should be clearly defined an explained. A plenty of competing definitions is offered by different authors. Thus, the main goal of the current research was to provide a deep understanding of the concept of financial literacy, specifying its key elements. To achieve the established goal, an analysis of the textual information was performed, using software AQUAD 6.0 and Hamlet II. Information data base included 52 definitions of the term ''financial literacy'' and the related terms proposed by individual researchers and organizations, such as OECD, EIOPA, ACIS and others. Completing the procedure of open-coding, the main directions of the research are detected: (1) analysis of key domains of financial literacy, which are knowledge, ability, attitude, and behaviour; (2) analysis of key aspects of financial literacy, e.g. numeracy, debt literacy etc. Analysis of frequencies within the framework of content analysis assisted authors to detect main elements of financial literacy and to define the most important competencies for financially literate behaviour. The results of content analysis provided by AQUAD and analysis of joint frequencies provided by Hamlet were used to perform the further analysis of the information, using hierarchical clustering technique. Diversified exploration of the concept of financial literacy allows constructing a platform to expand the horizon of its understanding. The received results will be used by the authors to develop a framework for assessing financial literacy level in Latvia.

Key Words

financial literacy, content analysis, joint frequencies

JEL Classification: D03, D83, G02

Introduction

Financial literacy, financial capability and the related concepts are frequently debated in the academic literature in the past 10 years. The importance of financial education is confirmed by different researchers [12, 22]. The issues related to the evaluation and improvement of financial literacy level became the development priorities in many countries [6, 10]. Financial skills and knowledge allows making efficient and reasonable decisions and, consequently, provides individuals with stable income. In turn, lack of financial literacy is considered to be the factor contributing to ill-informed financial decisions that could have a negative impact on the financial well-being [3, 14]. Financial literacy is an important element of economic and financial stability and development, because the ability to apply

financial knowledge in day-to-day life allows achieving not only individuals' goals, but also has a positive impact on economic health of the society [2, 20, 23].

The concept of financial literacy is closely related to the concept of financial capability. Sometimes these concepts are used interchangeably. Besides, there are some other associated concepts, such as financial numeracy, financial attitudes and financial self-efficacy, financial insight, financial culture, economic literacy etc. For the purposes of the current research the globally recognized term 'financial literacy' is being used. The research question has emerged examining a plethora of the competing definitions are offered by different researchers and organizations. There is no consistent approach to defining the concept and its core elements. Thus, the goals of the research are (1) to examine the existing conceptual definitions of financial literacy, (2) to define the key dimensions of the concept, and (3) to formulate its core cognitive and behavioural aspects. Several hypotheses were formulated by the authors:

- H1: Key dimension of financial literacy is financial knowledge and understanding;
- H2: Key element of financial literacy is numerical ability;
- H3: Different aspects of financial literacy are emphasized and contradictory definitions of the concept are proposed by individual researchers and organizations.

Considering high social importance of financial education, it is necessary to develop a knowledge platform to increase the level of financial literacy. Thus, further research should focus on issues about its evaluation and implementation of strategies to improve the financial literacy levels of certain groups of population. The current research provides a conceptual framework for understanding the concept of financial literacy, thus building a theoretical foundation for development of the methodology of financial literacy evaluation.

1. Literature review

The need for financial literacy has become significant with the deregulation of financial markets and the rapid growth in development and marketing of financial products [19]. Analysing the previous studies examining the link between the level of financial literacy and day-to-day financial management, it is stated that financially literate individuals are more likely to plan for retirement [23], more likely to participate in financial markets and perform better on their portfolio choice [11, 26] and they more likely to accumulate higher amounts of wealth [17]. In turn, individuals with low level of financial literacy tend to use costly methods of borrowing [8, 21], unable to judge their debt position [4] and become target of investment fraud [15]. Thus, an improved level of financial literacy helps individuals to achieve financial well-being, respond to life events in a confident manner and reduce the risk, hence avoiding distress and enhancing the sense of security.

The research question has emerged due to the inconsistency of proposed definitions of financial literacy notion. Different organizations and individual researches define it in a specific manner, emphasizing different aspects (Tab. 1).

Tab. 1 Financial literacy dimensions

Information source	Financial literacy dimensions
Robson (2012), [25]	Knowledge Attitude Behavior
Atkinson&Messy (2011), [3]	Awareness Knowledge Skills Attitude Behaviours
Orton (2007), [22]	Financial knowledge and understanding Financial skills and competence Financial responsibility
Remund (2010), [24]	Knowledge of financial concepts Ability to communicate about financial concepts Aptitude in managing personal finances Skill in making appropriate financial decisions Confidence in planning effectively for future financial needs
Widdowson&Kim (2007), [27]	Basic numeracy skills and basic arithmetic ability Understanding of the benefits and risks associated with particular financial decisions Ability to understand basic financial concepts Capacity to know where to seek professional advice

Source: authors' composition

Based on the analysis of extracted text segments including the term "financial literacy", it is concluded that most often financial literacy is defined as (1) a financial knowledge [7], (2) financial skills [16], (3) financial behavior [1] or a certain combination of elements [3, 12, 23, 27]. As for particular aspects of financial literacy, there is no coherence between researchers as well. Lusardi and Tufano [18] mainly focus on debt literacy. Gerardi *et al*. [8] decomposes the concept into money literacy, price literacy and budget literacy. According to Kefela [13], thematic areas for studying financial literacy are budgeting, savings, debt management, financial negotiations and bank services. Remund [24] defines five categories: (1) knowledge of financial concepts, (2) ability to communicate about financial concepts, (3) aptitude in managing personal finances, (4) skill in making appropriate financial decisions and (5) confidence in planning effectively for future financial needs. Multiplicity of definitions and underlying concepts generates a need for applying statistical methods in analysis of the extracted information.

2. Methods and empirical results

The main objective at the initial stage of the research was to reduce the information base in order to form a system of categories h can be used for further analysis. The procedure of open-coding, supported by AQUAD was performed, applying the strategy of generalization, however, following the principle of permanent comparisons [9]. Initial stage of coding yielded over 80 codes. Further, two systems of categories were used: (1) key domains of financial literacy, and (2) particular aspects of financial literacy (knowledge and skills necessary to be successful in financial affairs). For the purposes of the current research four key domains of financial literacy were defined: (1) knowledge (understanding is implied); (2) skills (competencies) to apply the knowledge; (3) attitude (set of values); (4) behaviour

(acting in a certain manner). The result of analysis of frequencies, provided by AQUAD, indicates that financial literacy most often is defined as a set of cognitive (knowledge and skills) and behavioural attributes (Fig. 1). Non-cognitive terms, such as motivation or confidence, are not mentioned so frequently.

Fig. 1 Frequency table: key domains of financial literacy

Table analysis (Project: FL2) Frequencies

	A	B
attitude	7	8
behavior	17	19
knowledge	18	16
skills	16	13
A: /Def researchers		
B: /Def organizations		

Source: own

To define the most important knowledge and skills that financially literate person should have, the codes from the initial code catalogue were grouped and replaced by meta-codes. The results of the second stage of content analysis yielded 18 elements:

- 11 elements related to ability to deal with finances: plan ahead; act effectively; analyse information; apply knowledge; compare options; make informed decisions; manage credit and debt; manage finance; numeracy; obtain information; set financial goals.
- 7 elements related to financial knowledge: borrowing-savings; budgeting; economic issues; financial concepts; financial instruments; financial services; investment.

Some of meta-codes were applied to replace a rather big amount of codes. For instance, the code 'CAN_manage credit debt' was used to label such units of meaning as 'ability to keep track of cash', 'ability to make ends meet', 'ability to make decisions regarding debt contracts' etc. To support the evidence provided by the AQUAD the further analysis was done by means of text analysis software Hamlet II 3.0. Hamlet generates statistics for individual and joint word frequencies and the corresponding frequencies expressed in a chosen unit of context. The wordlist for Hamlet was created based on the code file prepared for AQUAD and contained 9 entries and 40 synonyms. However, it was modified to get the list containing the most informative categories. Vocabulary list statistics is presented in Figure 2.

Fig. 2 Vocabulary list statistics

VOC.LST.	FREQUENCY	% VOC.LST.	% TEXT	CONTEXT UNITS
budgeting	13	8.18	0.64	10
choice	21	13.21	1.03	12
concepts	14	8.81	0.69	9
debt literacy	12	7.55	0.59	9
information	27	16.98	1.33	13
investing	16	10.06	0.79	8
numeracy	11	6.92	0.54	6
plan for future	26	16.35	1.28	13
services	19	11.95	0.93	14

Source: own

The most frequently mentioned and, thus, the most important notions are 'choice', 'information', 'investing', 'services' and 'plan for future' with the weight over 10 % in the vocabulary list. Figure 3 represents the results of the analysis of joint frequencies, displayed

in lower-triangular matrix format, labelled with the corresponding vocabulary list entries. As a similarity measure Jaccard index is used, because it is the most suitable index for textual analysis, as it treats joint non-occurrences as irrelevant [5].

Fig. 3 Matrix of joint frequencies based on Jaccard coefficient

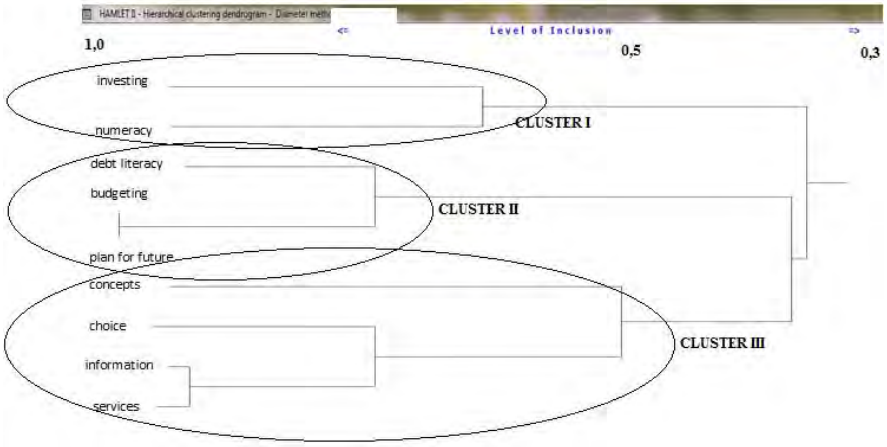
Jaccard coefficient - ignores joint non-occurrence

	i	1	2	3	4	5	6	7	8
budgeting	1								
choice	2	0.23							
concepts	3	0.05	0.08						
debt literacy	4	0.40	0.18	0.05					
information	5	0.24	0.38	0.14	0.20				
investing	6	0.36	0.09	0.18	0.38	0.17			
numeracy	7	0.19	0.09	0.18	0.38	0.12	0.33		
plan for future	8	0.53	0.29	0.13	0.32	0.25	0.28	0.10	
services	9	0.37	0.41	0.17	0.32	0.35	0.28	0.10	0.30

Source: own

The significant joint frequency (Jaccard index > 40 %) is observed between the following pairs: debt literacy – budgeting, plan for future – budgeting, services – choice. Besides, the strong link (Jaccard index > 35 %) is between debt literacy and investing, debt literacy and numeracy, information and choice, services and budgeting, budgeting and investing. The further analysis of the matrix of joint frequencies was performed using cluster analysis technique. The results are displayed in a form of hierarchal cluster dendogram (Fig. 4).

Fig. 4 Hierarchical clustering dendogram



Source: own

The main clusters (level of inclusion > 0.5) join the following entries: **Cluster 1**: investing, numeracy; **Cluster 2**: debt literacy, budgeting, plan for future; **Cluster 3**: concepts, information, services. Besides, all the notions are connected at relatively high level of inclusion (approx. 0.3). It provides the strong evidence that defined knowledge and skills are all essential for financially literate behavior. The further discussion of the obtained results is provided in the conclusion section.

The received results are crucially important for the further steps of the research – development a theoretical framework and measuring instrument for evaluation of financial

literacy level in Latvia. One of the most comprehensive issues is to develop an appropriate measurement scale that will provide an opportunity to get reliable survey results. Despite of variety of available measurement instruments, the authors consider that they cannot be used directly for evaluation of financial literacy level in Latvia. Firstly, the content of questionnaires is not relevant for analyzing economic reality in Latvia (for instance, some financial products are not provided by Latvian financial institutions). Besides, many of questionnaires are aimed to test just respondents' elementary numerical ability that is only one of financial literacy elements. The purpose of the authors to create an instrument that covers all the aspects of financial literacy, starting with a basic level (numeracy) and finishing with specific financial knowledge, such as understanding of financial markets. The results of frequency analysis (Fig. 2) can be used as a basis for making a decision regarding to inclusion of a certain element into a questionnaire. The information obtained in the result of joint frequencies analysis (Fig. 3) and cluster analysis (Fig. 4) will help to combine questions in sections according to the content (belonging to an appropriate financial literacy category) and the level of complexity and comprehension.

Conclusion

The current paper presents the results of the research aimed to explore the concept of financial literacy. Qualitative data (definitions and text segments) was processed, using AQUAD 6.0 and Hamlet II 3.0 software. Procedures of content analysis, joint frequencies analysis and clustering were applied to verify the developed hypotheses.

- H1: Key dimension of financial literacy is financial knowledge and understanding.
  The hypothesis was partially proved, because a knowledge domain is highlighted in a combination with behavior and skills. Many researchers emphasize an experienced knowledge, i.e. an ability to apply an acquired financial knowledge to make informed decisions regarding to financial matters.
- H2: Key element of financial literacy is numerical ability.
  Based on the results of the analysis, the hypothesis can be rejected. Frequency of the notion (Figure 2, 3) is much lower than for instance a frequency of 'information'. However, a numerical ability is absolutely necessary element for understanding of other underlying elements, as for instance, investing. Actually, the conclusion about the second hypothesis can be finally made depending on the subjective understanding of the term 'numeracy'. In case of its relation only to mathematical literacy, it can be irrelevant due to access to various tools for making calculates. However, if numeracy implies an ability to interpret the received results of made calculations, it is a basis for an ability to read, analyse and interpret financial information (notion 'information'). In turn, frequency of 'information' is the highest one among the entries (Figure 3).
- H3: Different aspects of financial literacy are emphasized and contradictory definitions of the concept are proposed by individual researchers and organizations.
  The hypothesis is rejected regarding to analysed domains of financial literacy – the importance of a particular domain is proved almost equally by individual researchers and organizations (Figure 1). In turn, there are certain differences, analysing particular aspects of financial literacy (Figure 2). For instance, an ability to compare options and make informed choice is focused mainly in studies of individual researchers.

The given research focuses primarily on individual financial literacy, rather than on its social aspects. However, it is admitted that the improved level of financial literacy has an impact on the wider society. The understanding of underlying concepts of financial literacy provides a theoretical foundation for further analysis in a field of its evaluation. The results of the current research will be used for development a methodology of evaluation the level of financial literacy of different target groups of Latvian citizens.

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Estimating the Regional Natural Rate of Unemployment: The Evidence from the Czech Republic

Abstract

The paper deals with development of the regional unemployment rate in the Czech Republic. The unemployment rate differed significantly among the Czech NUTS 3 regions during the period 2005 and 2012. According to previous studies high unemployment is caused by drop in economic performance or by some structural problems in the region. We can see that the development of the Czech national unemployment rate was correlated with the economic cycle. In other words, it means that during economic growth the unemployment rate is decreasing and during economic downturn it is increasing. We used Czech Ministry of Labour and Social Affairs monthly seasonally adjusted data during the observed period between the years 2005 and 2012. We have applied 2005 registered unemployment methodology. In total, we had 96 observations. We also applied the Hodrick-Prescott filter for estimating the natural rate of unemployment. This method is often used for estimating the potential output and is possible to use in the case of unemployment. Our empirical results show that in most regions the real unemployment rate was lower than the natural rate of unemployment during the pre-crisis period. In other words, it means that the Czech labour market was in positive unemployment gap. However, this gap was not the same in all regions. We found that the positive unemployment gap was lower in the problematic regions like the Ustecky and Moravskoslezsky region. These findings suggest that these regions still have to face some structural problems and the labour market is not so flexible as in the rest of regions. In addition, we also found that the natural rate of unemployment has shifted permanently higher in comparison with the pre-crisis period.

Key Words

Czech Republic, Hodrick-Prescott filter, natural rate of unemployment, regional disparities

JEL Classification: C51, E01, E24

Introduction

One of the key macroeconomic indicators is the unemployment rate which shows labour market performance. The traditional understanding means that if this indicator is increasing, labour market performance is worsening and vice versa. In addition, labour market development is closely associated with the economic cycle and we can say that economic performance influences the situation on the labour market. A deterioration of labour market performance could be also associated with a widespread expansion of the informal economy [3]. Moreover, sufficient labour market performance is subject to a

corresponding economic performance. The past economic crisis has hit the European Union Member States´ labour markets especially hard. Unemployment has been a recurrent problem in most European Union Member States including the Czech Republic for the last decades and it has become a major concern among not only policymakers but also the society as a whole.

The aim of this paper is to compare labour market development in the Czech NUTS 3 regions in the period between the years 2005 and 2012. We also compare development of the registered unemployment rate in comparison with the natural rate of unemployment. For this purpose, we applied the Hodrick-Prescott filter as the method how to estimate the natural rate of unemployment. The paper is structured as follows: the introductory section deals with methodological-theoretical aspects of the natural rate of unemployment and its relationship with the real unemployment rate and economic performance. In the second part, we described the method (the Hodrick-Prescott filter) used in the paper and in the third, empirical, section, we compared labour market development among the Czech NUTS 3 regions and the last part concludes.

1. Theoretical background

The concept of the natural rate of unemployment (NRU) represents the hypothetical unemployment rate consistent with aggregate production being at the "long-run" level. This level is consistent with aggregate production in the absence of various temporary frictions such as incomplete price adjustment in labour and goods markets. The natural rate of unemployment therefore corresponds to the unemployment rate prevailing under a classical view of determination of activity. It is mainly determined by the economy's supply side, and hence production possibilities and economic institutions. If these institutional features involve permanent mismatches in the labour market or real wage rigidities, the natural rate of unemployment may feature involuntary unemployment.

Romer [14] argues that the development of the theory of the natural rate of unemployment came in the 1960s where economists observed that the Phillips-curve relationship between inflation and unemployment began to break down. Until then, it was widely believed that a stable negative relation between inflation and unemployment existed. This belief had the policy implication that unemployment could be permanently reduced by expansive demand policy and thus higher inflation. Nevertheless, if we look at the original Friedman´s paper [1] we do not find a clear, well-defined characterization of this concept, but rather description of some features that it should have. This resulted in the hysteresis hypothesis, which states that cyclical fluctuations in the labour market might affect the unemployment rate permanently and might lead to a long-term persistence. This means that the unemployment should be an integrated process (see [3]).

According to Weiner [18] when the economy is at the natural rate of unemployment, inflation tends to be constant from one year to the next. Individuals come to expect this inflation rate and base their decisions on it. Any attempt to use monetary of fiscal policy to reduce unemployment below the natural rate of unemployment ultimately results in higher inflation. Under such a scenario, aggregate demand increases, prices rise, but wages initially

lag behind. As a result, firms have an incentive to hire more workers to produce more output and the unemployment rate declines. The decline in unemployment is temporary, however, because workers eventually demand higher wages. The increase in inflation, in contrast, is permanent. The central bank can set the inflation or the economic cycle. If the central bank follows the inflation variability, the society must tolerate the output gap variability. On the other side central bank can set the economic cycle goal. It means the central bank minimises the output gap variability (for more detailed analysis see Kotlán [10]).

The OECD distinguishes between a long-run structural rate of unemployment (NRU), corresponding to Friedman's original natural rate, determined by economic fundamentals, and the non-accelerating inflation rate of unemployment (NAIRU) as a short-run phenomenon. The latter may differ from the NRU, when structural or demand shocks occur. In general, the NAIRU is considered an extension of Friedman's natural rate when labour markets are not competitive and most of the literature overlaps the two concepts (see [8]).

2. Methodology

Based on Němec [12], Tasci [16], Tvrdon, Tuleja and Verner [17] and da Silvia Filho [15] we applied the Hodrick-Prescott filter (HP filter) for estimation natural rate of unemployment (NRU). This method is quite frequently used to filter the trend and the cyclical time series. To estimate the natural rate of unemployment, it is necessary to have just the time series of the unemployment rate – in our case the registered one. The only input parameter for the optimal filter, we have to specify, is an appropriate smoothing constant λ. It is defined as the ratio of dispersion of shock causing cyclical fluctuations and shocks affecting the growth trend [7].

The filter is characterized by this formula [6]:

$$Min\left\{\sum_{t=1}^{T}\left(\ln U_t - \ln U_t^*\right)^2 + \lambda\sum_{t=2}^{T-1}\left[\left(\ln U_{t+1}^* - \ln U_t^*\right) - \left(\ln U_t^* - \ln U_{t-1}^*\right)\right]\right\} \quad (1)$$

where U denotes the registered unemployment rate, U^* is the natural rate of unemployment, λ is a parameter determining the smoothness of the trend smoothing. For $\lambda = 0$ the natural rate of unemployment is equal to the real unemployment rate, for $\lambda \to \infty$ the trend will be a straight line.

When choosing a value of smoothing constant λ, we then drew on generally accepted recommendations – experts consider optimal value 14400 for monthly data, 1600 for quarterly data and 100 for annual data (Rozmahel [13], Gerlach and Yiu [2], Zimkova and Barochovský [19] or Hájek and Bezděk [6].

Monthly national and regional (NUTS 3 level) unemployment rate between the years 2005 and 2012 obtained from Ministry of Labour and Social Affairs database were applied. The standard ANOVA (analysis of variance) was carried out in order to determine the presence of monthly seasonality in the unemployment rates series. Unemployment rates usually

exhibit significant seasonality. There are several methods and techniques to adjust time series, e.g. Census X12 and TRAMO/SEATS. The first program is produced and widely used by the U.S. Census Bureau.

TRAMO (Time series regression with ARIMA noise missing observations and outliers) and SEATS (Signal extraction in ARIMA time series), was developed by Gómez and Marawall [4]. For more details to seasonal adjustment and TRAMO/SEATS method see Gómez and Marawall [5]. TRAMO preadjust the series to be adjusted by SEATS [11]. Both of them are officially used by Eurostat and Czech statistical office. Hence this method was applied to seasonal adjustment.

3. Empirical results

Table 1 shows development of real gross domestic product between the years 2005 and 2009. Based on Eurostat data we computed the growth rate of real gross domestic product. As seen from the table the growt rate was significantly affected by the economic crisis. Most regions recorded high growth rate of real GDP except Jihočeský, Plzeňský and Liberecký region in 2007. For more detailed analysis of development the real economy see [17].

Tab. 1 Real gross domestic product growth in NUTS 3 regions (based on constant prices – year 2005)

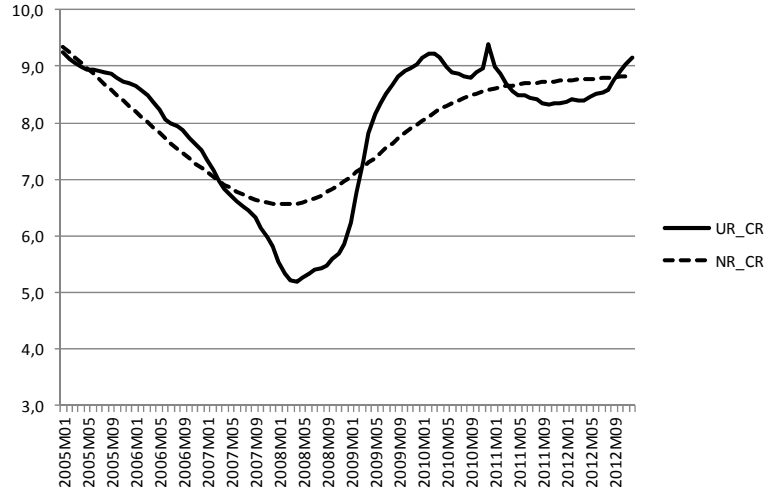
Region	2005	2006	2007	2008	2009
Hlavní Město Praha	8.1	7.6	4.4	9.3	-5.1
Středočeský	4.6	11.5	2.7	7.5	-6.6
Jihočeský	7.7	6.6	-2.3	2.7	-2.2
Plzeňský	4.3	7.7	-0.4	-1.0	-3.0
Karlovarský	3.9	2.1	1.1	3.0	-2.2
Ústecký	6.1	6.3	0.1	6.2	-0.4
Liberecký	10.9	4.9	-3.0	3.5	-5.5
Královehradecký	4.5	4.2	2.1	6.2	-3.0
Pardubický	4.5	9.0	2.2	3.7	-5.6
Vysočina	6.9	6.9	2.1	1.5	-2.8
Jihomoravský	6.0	7.6	2.7	9.4	-4.3
Olomoucký	3.0	4.7	1.9	6.9	-4.4
Zlínský	7.5	7.6	1.5	10.6	-4.2
Moravskoslezský	10.4	4.3	2.2	7.7	-8.6

Source: OECD

Figure 1 shows development of the real unemployment rate and the estimated natural rate of unemployment at the national level. As seen from figure, the real unemployment rate was below the natural rate of unemployment in the pre-crisis period (from January 2007 till May 2009). We can also say that the labour market reacted on lower economic performance with some delay. However, the unemployment rate increased sharply at the beginning of the crisis. The period from June 2009 till December 2010 can be characterized as the economic crisis with relatively high national unemployment rate which was higher compared to the estimated natural rate of unemployment. There had been seen some signs of slight recovery during this period, however the unemployment rate increased again. A full recovery started during the year 2011 when the real unemployment rate was lower than the natural one.

Nevertheless, the both the real unemployment rate and the natural rate of unemployment were higher in the comparison with the pre-crisis period. Moreover, we can say that the level of both rates were still growing.

Fig. 1 Czech natural and real unemployment rate national monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

One of the main questions of this paper is if this development has experienced rest of the regions. As written above there are 14 NUTS 3 regions in the Czech Republic. These regions have similar economic level with the exception of the capital city of Prague. However, their competitiveness is different (for more detailed analysis see [9]). We have chosen two regions with the lowest unemployment rate (Praha and Středočeský region) and two regions with the highest unemployment rate (Moravskoslezský and Ústecký region) for our analysis. The situation in the rest of the regions was similar – the real unemployment rate was remarkably lower than the natural rate of unemployment in the pre-crisis period. After the outbreak of the crisis in the real economy, the unemployment rate increased rapidly and was higher during the crisis compared with the natural rate of unemployment.

Fig. 2 Natural and real unemployment rate, Praha monthly data, 2005 – 2012

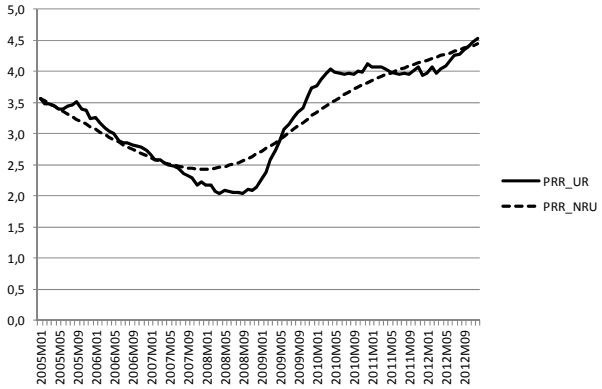
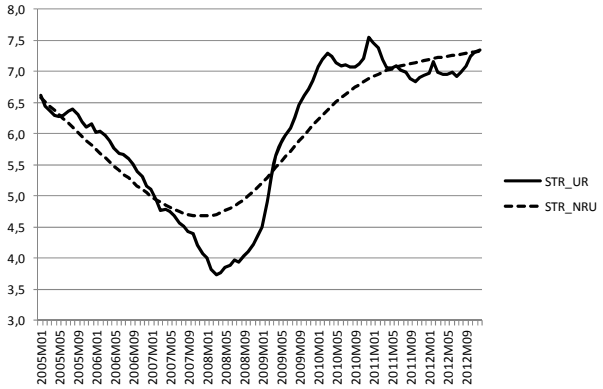


Fig. 3 Natural and real unemployment rate, Středočeský kraj monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

The region of the capital city and Středočeský region were regions with the lowest both the UR and NRU (see figure 2 and 3). Economies of these two regions are mainly focused on the tertiary sector which consists of sectors with higher added value. Moreover, the labor force in the Praha region is significantly higher qualified in comparison with other regions (together with traditional skills and abilities of professional flexibility). Labour demand is very stable in Praha region and we can also argue that the development in the Praha was more stable during the observed period as results of the dominant position of the capital city with a high proportion of knowledge-based sectors. Středočeský region has an advantage that is based on its position which is closed to the capital city. This region is also attractive for direct foreign investment. Lower unemployment rate in comparison with other regions is mainly determined by the strong position of the automotive industry in this region.

Fig. 4 Natural and real unemployment rate, Moravskoslezský kraj, monthly data, 2005 – 2012

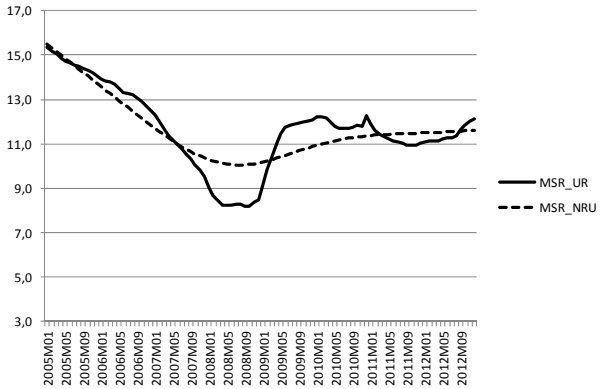
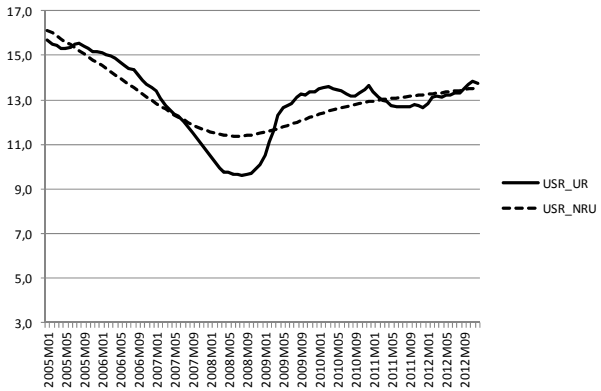


Fig. 5 Natural and real unemployment rate, Ústecký kraj, monthly data, 2005 – 2012



Source: Czech Ministry of Labour and Social Affairs

Figure 4 and 5 illustrates situation in the most problematic Czech regions – the Moravskoslezský and Ustecký regions. Economic transition and restructuring of production after 1989 (loss of some traditional industries and sectors – textile and clothing industry, mining and quarrying, some engineering fields, construction and chemical industry), among other things led to extensive changes in industry structure and changes in the distribution of economic activities of the regions´ economic base. In the same period, there was also a significant reduction in employment in the primary sector and partly in the secondary sector, increased employment in services. However, this process was problematic in comparison with other regions. Firstly, both the real unemployment rate and the natural rate of unemployment were significantly higher than in other regions during the observed period. However, as seen from figure 3 deterioration of labour market performance did not have so dynamic development. Secondly, an interesting fact is that levels of both rates did not differ remarkable, especially in the pre-crisis period. It means that some structural problem still existed in these regions.

Conclusion

The aim of this paper was to examine influence of the economic crisis on the Czech economy, especially in the regions during the period 2005–2012. We compared

development of the unemployment rate and the natural rate of unemployment. We applied the Hodrick-Prescott filter (HP filter) for estimation the natural rate of unemployment. This method is quite frequently used to filter the trend and the cyclical time series. Research in this study is based on regional monthly data between the years 2005 and 2012 (registered unemployment rate) which were published by Ministry of Labour and Social Affairs. As is evident from the analysis the Czech labour market was in a relatively strong positive unemployment gap before the crisis of the real economy. We argue that the decline of labour market performance during the crisis was the first step to return to a state of long-term equilibrium. This argumentation may seem at least controversial, but if we look at the situation before the outbreak of the economic crisis, then we can see that the Czech economy was in a relatively strong expansion. This resulted in usage the production factors (especially labour) with the too much intensity in the Czech Republic, and it was untenable in the long-run view. We found out the difference between the estimated natural rate of unemployment and the unemployment differed among the regions. We found that the positive unemployment gap was lower in the problematic regions like the Ustecky and Moravskoslezsky region. These findings suggest that these regions still have to face some structural problems and the labour market is not as flexible as in the rest of regions. In addition, we also found that the natural rate of unemployment has shifted permanently higher in comparison with the pre-crisis period.

Acknowledgements

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Collaborative Tools in Project Management

Abstract

The paper presents a brief introduction to the issue of collaborative tools and provides the survey of those that can be used for project proposal development and for project management. Several categories of tools are investigated (collaborative text processors and other authoring tools, dropboxes, whiteboards, shared calendars, teleconferencing, etc.).

On the basis of their own experience from project proposal preparation and project management the authors summarize the advantages of these tools over the traditional methods based on sequential processing of various files and documents and present arguments for their use, as they can significantly facilitate the work of the project team, especially in projects with geographically distant partners. Using currently available collaborative tools prepares the users for the work in rapidly developing cloud computing environment.

The role and stages of project management office as a supporting structure for project development and managenent is briefly described in the third section of this paper. In the concluding part the authors provide a list of available tools with links and references; many of them belong to the shareware or freeware and can be therefore easily implemented and tested.

Key Words

project management, collaborative tools, project management office

JEL Classification: M10, M15

Introduction

A collaborative tool is a groupware application that allows members of the team to work on one (or more) tasks using different computers. There are two types of collaborative tools:

- Synchronous (real time, simultaneous), allowing team members performing tasks at the same time; each member sees what the others are doing; all modifications are included in one final document.
- Asynchronous, meaning that team members perform the tasks at different times; the workflow between members can be controlled (only one person has access at any given moment) or random (every team member modifies the document separately and in the end one person summarizes all work done and creates a final version).

If we take into account that the tasks can be performed at one place or at geographically distant places, the groupware applications can be classified according to Table 1. Collaborative synchronous applications generally permit both synchronous and asynchronous work.

Tab. 1 Groupware classification

	Synchronous	**Asynchronous**
Different places	Chat, videoconferences, Skype, web-based and client-server applications	E-mail, text conferences, workflow for distributed team, dropbox
Same place	Face-to-face, team work, shared boards	E-mail, workflow for local team, KnowledgeTree

Source: authors

In the following sections of this paper we will focus on the use of collaborative tools in project management and we will give references and links to some useful tools. The role and stages of project management office as a supporting structure for project development and managenent is briefly described in the third section of this paper.

Our goal here is to use our experience with the preparation of project proposals with many, often international, partners and their management. Even if it is not the high-level research, we hope that presentation and comparison of available tools can be interesting and practically useful for potential project managers. The bibliography includes links to resources providing more detailed information about the tools and their availability. Many of them belong to the shareware or freeware and can be therefore easily implemented and tested.

1. Advantages and disadvantages of collaborative tools

As in the synchronous mode the speed of communication is limited by network lag and the users need incorporating their modifications instantly, then, due to communication lag, their modifications may be inserted into different versions of the document. This problem can be solved in a client-server architecture: one of the application instances is assigned the role of collaboration server when the document is opened. This server receives notifications of changes made to the document by other users, determines how those changes should affect its local copy, and broadcasts its changes to the collaboration pool. As a result, we obtain a single final document incorporating all modifications done by the team members. This approach is used e.g. in Zoho [15] and Google documents [16].

If we compare this approach with traditional one, when the document is distributed to the team members, each of them inserts the modification to the local file and sends it back to the common editor, than this person can get back many files and must combine them into one resulting document. Often different modifications are proposed at the same place and the next round of revisions is necessary. Probably the majority of us have experience with this kind of work, e.g. revising the word document in the revision

mode and trying to create the final document from different (maybe 10 or even more) versions. For the final editor this is quite cumbersome experience.

What can be a disadvantage of collaborative tools using shared data pools in the cloud is the security of documents. The user loses direct control over the files and therefore, when working with sensitive data, the additional security measures must be applied. One of the possible solutions – decoding and encoding the files – practically eliminates synchronous option, but can be well realized in asynchronous applications, e.g. in Dropbox [21] or KnowledgeTree [22].

These applications are also suitable for building the project document repository; University of Bohemia supports Knowledge Tree as the shared document pool [23].

2. Collaborative tools and project management

The project management is nothing but planning, organizing and managing the resources. But what is the right way to do it? Are there any tools facilitating project preparation, management and assessment? Under what conditions are they available, how user-friendly they are and what are their main features? We will try to answer these questions in this article and, on the basis of our own experience, give some hints to potential users.

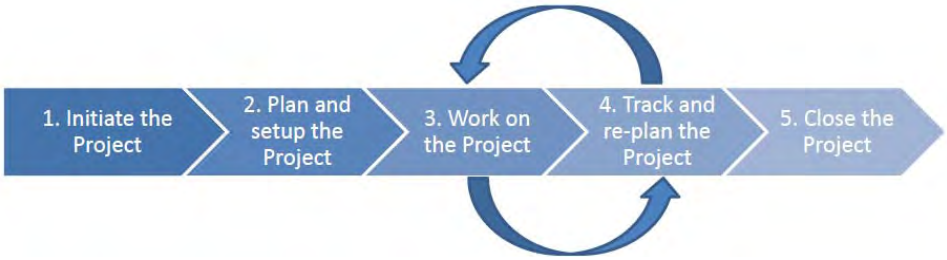
As stated in [1], "Rapid evolution of communication technologies is making distributed projects increasingly viable. The project participants could be widely dispersed yet coordinated by sophisticated tools." Romano, Chen and Nunamaker in [2] propose a five-level hierarchical framework for collaboration and in [3] they propose collaborative project management architecture based on the following observations: "The PM paradigm has changed due to increasing number of distributed project collaborators from different locations, organizations and cultures. ... A high degree of informal and ad hoc communication is important for distributed project success. ... A collaborative PM tool focuses on explicit representation of project information and timely sharing of the information. ... A collaborative PM tool should facilitate members in conducting group processes such as: generating ideas, organizing ideas, and selecting alternatives. If results are stored in a permanent repository they can be used for future project analysis." The authors also draw attention to the importance of transformation of tacit to explicit knowledge, well described by the SECI cycle introduced in Nonaka and Takeuchi in [4] and broadly used in today´s knowledge management.

BrightWork´s Collaborative Project Management: A How-To Guide [5] provides "An easy to follow and simple to use Project Management Guide for Project Managers who are not yet formally trained in Project Management and who may not yet have the time or budget for training." Their approach to collaborative project management comprises the five stages (see Fig. 1).

CASA Guide to Managing Collaborative Processes can serve as a case study describing the application of theoretical concepts in the practice of a specific organization. As the

authors say, the goal of their Guide is "*facilitating multi-stakeholder Project Teams as well as for those who participate in the process. Not intended to be exhaustive of all skills required, it provides a description of the tools and steps fundamental to collaborative decision making and integrates more structure and discipline into the process.*" [6, p. 9]

Fig. 1 Five stages of the collaborative project management



Source: [5, p. 5]

Google search for "collaborative tools in project management", performed on April 5, 2013, returns approximately 8 180 000 links. However, if you browse several top pages, you see that the prevailing majority of links is to companies offering online integrated project management systems, which are usually based on subscription fee depending on the number of users, features, etc. These SW packages let you collaborate with project resources, manage project users, analyze risks, assign tasks, coordinate schedules and make your project a success from anywhere in the world. These project management apps can save you time, but, especially at the very beginning, they can also be quite time-consuming and not intuitive. Furthermore, for current use at the university they too expensive. Some of the applications offer free trial (usually for 1 month), only a few of them offer free access, but with severely limited toolset (e.g. Zoho Projects [14]).

Collaborative project management and project portfolio management is offered by MS Project 2010 server version. This application was installed at the University of West Bohemia with support of the FRVŠ project 1573/2012 "Vybavení počítačových učeben pro výuku projektového managementu" (Equipment of computer laboratory for project management courses). In winter semester 2012/13 the desktop MS Project Professional 2010 [11] was implemented in the Project Management course of the bachelors study programme. The course was attended by 178 students. The MS Project Server 2010 will be introduced in 2013/14. This SW package provides many of the collaborative features, but its use is limited only to the local university installation, potentially for collaboration with project partners using the same software. The currently offered MS Project 2013 suite [12], [13] offers extensive toolset for online collaborative project management, but similarly to earlier version, its use is limited by price and partners using the same application.

In the following parts of this contribution we will focus on less demanding, often free- or shareware applications that can facilitate the preparation of the project proposal, monitoring the project progress, prepare project reports, evaluate the project results and archive the project documentation.

2.1 Project proposal development

Project proposals are today often finalized and submitted in web applications like e.g. BENEFIT7 [9], used for the EU Structural Funds in the Czech Republic. However, these applications are not very suitable for project proposal development, especially in its initial phases. Generation of project ideas can be supported by brainstorming, mind maps and other tools described in section 4.

The project proposal development phase is often quite hectic – the deadlines, even if at the very beginning of the process seem distant, are approaching too fast and the time pressure in the last days is quite exhausting, especially for project coordinator.

Typical projects at universities involve several partners from different organizations, often from several countries. It is impractical to suppose that all of them will use the same complex online project management software package and therefore we are limited by the use of commonly available tools, mostly from freeware or shareware category. In the phase of project proposal development we must formulate project goals and objectives, form project team, define work packages, assign responsibilities of project partners, allocate resources, develop project budget and project schedule. Most working documents in this phase need not be strictly formally structured; usual formats are text files and spreadsheets, most often MS Word and MS Excel from the MS Office suite. These types of documents can be shared in easily available synchronous applications ZohoWriter [15] or GoogleDocs [16] or asynchronous data repositories as Dropbox [21] or KnowledgeTree [22].

Additional appendices, as Gantt chart, organizational diagrams, mind maps, etc. are usually prepared by project coordinator in locally available applications, in our case MS Project 2000 [11], SmartDraw [20] and MindManager [18] or X-Mind [19], finally usually converted to pdf files and appended to the project proposal.

Indispensable tool in this phase is Skype [24] – both for one-to-one and for the team communication. With Skype, it is quite easy to share the ideas and directly implement them into the project files. MP3 Skype Recorder [25] allows recording the communication so that it can be referred to later on and shared with those project team members who were not able to participate in the discussion. Even with all sophisticated tools, we must not forget to organize the kick-off meeting as soon as possible – the face-to-face meeting cannot be replaced by even the best technology.

2.2 Project management and monitoring

After the project approval the work packages leaders must lead their local teams and report their progress to the project manager, who then must periodically submit progress reports, including financial reports. As the structure of these reports differs for different types of projects, grant agencies, etc., we again usually resort to informal working documents created in some type of shared environment and the project coordinator then must collect all the necessary information and submit it in the required

form (usually through some web application) to the project sponsor. The tools used are similar to those described for the project proposal development. Again, we must not forget personal meetings and workshops.

3. Project management office

Collaboration in projects can be assisted by project management office that in larger organizations (including our university and faculty) provides support to project managers. We can distinguish the two following types of the management office (PMO) according to the extent of its activities:

- PMO providing basic services to project managers – information, selected administrative tasks, possibly including accounting;
- Integrated PMO involving project managers who manage all projects in the organization.

Among the basic PMO´s activities are:

- developing and implementing process framework and the methodology of project and project portfolio management,
- developing and delivering project management trainings,
- improving cooperation between project and functional managers,
- supporting project preparation, management and administration,
- collecting and sharing best practices, creating and maintaining the knowledge database related to project management

The typical PMO services, activities and tools are well described in [8] (see Fig. 2) and can be used as the model for any PMO. According to [7] we can distinguish five basic phases of the PMO development:

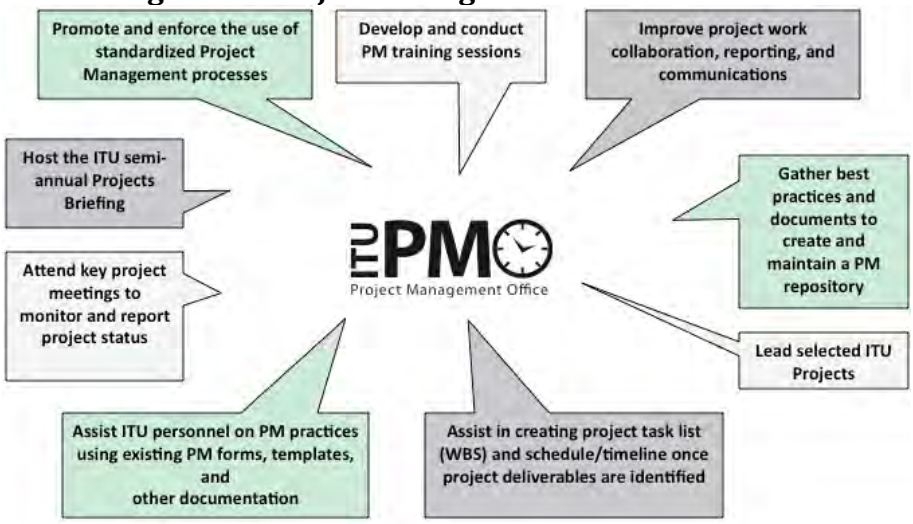
1. Project office – usually 1 project manager responsible for successful performance of one or more projects;
2. Basic PMO – providing standard methodology and tools reusable for multiple projects;
3. Standard PMO – creating and implementing infrastructure of the organization´s project management, providing services to individual projects and project managers;
4. Advanced PMO – using integrated and complex approach to project management within an organization, project portfolio management;
5. Centre of excellence – separate unit having responsibility for organization project and project portfolio management, continuous improvement of the methodology, process framework and cooperation between organization´s units.

The type and phase of the PMO development implies the use of collaborative tools and techniques. Beginning from the 3-rd phase of the PMO development the use of

collaborative tools seems to be indispensable due to necessary efficient cooperation and coordination.

The PMO operates at the UWB Faculty of Economics in mode 3 with the goal to proceed to higher levels of operation.

Fig. 2 ITU Project Management Office Services



Source: http://pmo.gmu.edu/images/ITPMOmaingraphic.jpg

4. Where to find the tools (links, references)

We participated in the development of one of partial outcomes of the Leonardo da Vinci project InnoSkills – The Informal and Cooperative Learning Guide [26], which together with the InnoSkills Innovation Rooms describes several categories of collaborative tools for innovation management; however, they can be quite as well used for project management.

The Guide provides explanations on how to efficiently use the tools and benefit from them. All the tools were tested by InnoSkills partners in practical situations. Their experience, lessons learned, benefits and challenges, tips & tricks are described in the Guide together with links to websites from which the users can download the SW and further information about the product use.

We explored tools for the following categories:

- ***Brainstorming*** Brainstorming is a creativity technique designed to generate a large number of ideas. It can help to develop project ideas at the very beginning of the project proposal development.
- ***Mind Mapping*** A mind map is a diagram used to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea. Mind maps are used to generate, visualize, structure, and classify ideas, and as an aid in study, organization, problem solving, decision making, and writing.

SW: MindManager [18], freeware alternative: X-Mind [19]

- ***Collaborative Text Processors*** A collaborative document processor is a form of collaborative software application that allows several people to edit a file using different computers.
  SW: Zoho [15], Google [16]
- ***Whiteboards*** This kind of software allows a defined number of persons to work together online from different locations on a document, discuss a website, draft any schemes etc.
- ***Online Polling*** An online polling is a survey in which participants communicate responses via the Internet, typically by completing a questionnaire in a Webpage. Online polls may allow anyone to participate, or they may be restricted to sample drawn from a larger panel.

Conclusion

At present, in the university environment, we cannot rely on complex online project management collaboration software packages and we must resort to generally accessible applications, mostly from the free- and shareware categories. However even those less sophisticated tools allows us to build a toolset that can significantly facilitate collaborative work in all project phases. This paper describes various elements of such a toolset currently used at the University of West Bohemia.

We would like to conclude by the quotation of U.S. Army general and minister of defence Colin Powell: "There are no secrets to success: don't waste time looking for them. Success is the result of perfection, hard work, learning from failure, loyalty to those for whom you work, and persistence"

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The Economic Growth and Human Capital: The Case of Visegrad Countries

Abstract

Impact of education, more precisely impact of skills and knowledge (human capital) to increase individual productivity and wealth of nation, was already emphasized by classical economists. Comprehensive concepts of theory of human capital appeared in the early Sixties of 20th century. In the last two decades, the influence of human capital, more precisely influence of education on economic growth and productivity was confirmed by many economic studies. Human capital as an additional production factor is included in the new theories of economic growth. On the contrary, some experts criticize this unambiguous and inconclusive relation and some of them even disprove this hypothesis, publishing their studies. A lot of researchers expressed human capital as investment or expenditure in education, schooling enrollments or average length of education. In authors' opinion, these variables do not seem to be appropriate indicators of human capital. This paper deals with the relationship of human capital and economic growth in Visegrad group countries during the period 1999-2010. We consider increasing in human capital will tend to economic growth and thus will contribute to improvement of national competitiveness. Because of the lack of observations the importance of human capital in the economic growth of these countries is being proven by using panel data analysis. The value of human capital is expressed by the graduates' groups at the educational level, while economic growth is expressed by gross domestic product per capita. Annual data collected from Eurostat and converted into logs were employed. We found out the positive relationship between tertiary graduates and economic growth, on the other hand negative link between secondary graduates and economic growth.

Key Words

economic growth, human capital, national competitiveness, panel data model

JEL Classification: J24, C23

Introduction

„Changing economic and social conditions have given knowledge and skills – human capital – an increasingly central role in the economic success of nations and individuals. … The key role of competence and knowledge in stimulating economic growth has been widely recognised by economists and others." [21]

Aim of this paper is to investigate the relationship between human capital and economic growth. We want to find out whether educational expansion could affect economic growth in case of Visegrad group countries. Furthermore, we assume the higher economic growth the greater improvement in the competitiveness at the national level. There are many

definitions and concepts of national competitiveness and therefore there is not only one approach and definition is still not unique [29].
In accordance with Porter [22] the only meaningful concept of macroeconomic competitiveness is national productivity. Based on this conception and relating approaches (e.g. [26]) someone could consider productivity and competitiveness as synonym words. We can thus apply the approach in Hančlová [12] and express competitiveness easier way by means of GDP per capita. European Union defines competitiveness like an ability to provide its citizens high and still rising standard of living and employment to all who wants to work [16]. As we can see modern approaches to national competitiveness stress the standard of living and human well-being.

The paper is structured as follows. In Section 1, we deal with human capital, economic growth and their relationship. In Section 2, we introduce and describe the dataset and specify the used methods. In Section 3, obtained results are presented and discussed. Section 4 concludes the paper with summary of crucial findings.

1. Human capital and economic growth

The influence of education, actually of knowledge and skills (respectively human capital) to increase the productivity of individuals and the nation's wealth has been emphasized already by classical economists. For example, Balcar [2] points out that A. Smith in his book *An Inquiry Into the Nature and Causes of the Wealth of Nations* (1776) expressed the view that education is a form of investment that should bring individual returns which exceed the training costs and time spent learning. Balcar [2] refers to another important economist A. Marshall, who in his book *Principles of Economics* (1890) also notes that the most valuable capital is the one which is invested in human beings.

Education, however, was considered in the past to be social consumption. The change in the view of education and comprehensive concept of human capital theory in particular, was brought by the Chicago School of economists especially, namely Schultz with his book *Investment in Human Beings* (1962) and Becker in his book *Human Capital* (1964). Becker [8] defined human capital as skills and adequate motivation to apply these skills. The main premise, which the human capital theory is based on, postulates that education increases the productivity of the individual. Each individual tries to optimize the return on their investment in education and will continue in the study until the rate of return on her investment in education will exceed the rate of returns of alternative investments.

The benefit to the society is then the increased labor productivity of better educated members of society and also technological progress. Schultz [25] in his work focused primarily on the problems of developing countries, where he believes that the source of growth in these countries can be an investment in human capital. Generally, economists of the 1960's were trying to determine how various factors contribute to economic growth.

Human capital as a production factor is included in the new growth theory models. Total product in the endogenous growth models is determined by both physical capital and labor and human capital which is accumulated in through education in every individual. The new

growth theory applies the extended Solow's model and production function presented in the following form [6]:

$$Y_t = (A_t L_t)^{1-\alpha-\beta} K_t^{\alpha} H_t^{\beta} \quad (1)$$

where Y is the product, A shows the level of technology, L is the labour, K is the physical capital, H is the human capital, α and β determine the proportions of individual factors on the overall product.

P. M. Romer, R. E. Lucas (see [18]) and also N. G. Mankiw, D. Romer and D. Weil contributed significantly to the development of endogenous growth models. Overall, the research in this area confirms the existence of a relationship between the development of education and economic growth. One of the conclusions of endogenous growth models is that economic growth depends partly on the level of human capital. It assumes that human capital is the source of production of new ideas. It is true that the more developed economy, the stronger the relationship of education to the economic growth. While in less developed countries the primary task of starting economic growth nationwide is to ensure primary education, in the developed countries on the other hand is to drive further economic growth primarily on ensuring tertiary education. Romer [24] in his work addresses the issue of differences between the education and experience on the one hand, and technological progress on the other. The main source of economic growth is technological progress, in his opinion. Mankiw, Romer and Weil [20] in their work tried to eliminate shortcomings of the Solow's model by including the human capital expressed as an investment in education. Simplified representation of the value of human capital, respectively identification of human capital investment in education, with the achieved level of education or the number of students in various stages of study, is often a prerequisite in empirical studies examining the human capital at the macroeconomic level.

Barro [4] and others find a strong positive correlation between schooling enrollment and the subsequent growth rate gross domestic product (GDP) per capita. Barro [5] states that the growth of human capital expressed as an average length of education by one year corresponds to an increase of GDP growth by four percentage points a year. Bassanini and Scarpetta [7] states, that their results point to a positive and significant impact of human capital accumulation to output per capita growth. If the average length of study period is ten years, one additional year of study will increase production by six per cent. The existence of correlations between human capital, in this case the number of university graduates, and economic growth in their work was also confirmed by de la Fuente and Donénech [11]. Through that research the need for investment in human capital can be justified. However, there are views that refute or do not confirm the influence of human capital on economic growth. Bils and Klenow [9] in their study do not disprove any correlation between economic growth and human capital. However, they concluded that it is the level of gross domestic product, respectively its growth, leading to a higher level of human capital in the economy. Unlike previous studies on the causality of these variables this one is seen in the reverse order. Söderbom and Teal [27] came to the conclusion that human capital has a small and not statistically significant effect, on the level of output. There are some studies that confirmed negative sign, i.e. negative relationship between economic growth and human capital. Pritchett [23] argues (i) newly created human capital goes to socially

unproductive activities, (ii) higher supply of human capital than demand decreases the returns to schooling, (iii) more schooling years does not mean more skills.

2. Data and econometric methodology

A lot of researchers expressed the human capital as investment or expenditure in education, schooling enrollments or average length of education. From our point of view, as well as, e.g. [23] and [10] these variables are not suitable indicators of human capital. It seems better to use graduates to express human capital.

We employed annual data for Visegrad group countries (Czech Republic, Hungary, Poland and Slovakia – hereinafter V4 countries) between 1999 and 2010. GDP per capita in EUR (2005 constant prices and annual exchange rates) was used as a proxy variable of economic growth, while for human capital we used secondary and tertiary education, more precisely secondary graduates (ISCED'97 level 3 and 4) and tertiary graduates (ISCED'97 level 5 and 6). All the time series were collected from Eurostat and converted into logs.

To examine the above mentioned relationship we perform panel data analysis. Panel data (or longitudinal data) cover both a time series and a cross-sectional dimension compared to pure time series or cross-sectional data [30]. Panel data models have become more and more popular among researchers because of their capacity for capturing the complexity of human behavior as contrasted to cross-sectional or time series data models [14]. Klevmarken [15], Hsiao [14] and Baltagi [3] list a number of panel data's benefits, e.g. (i) controlling for individual heterogeneity, (ii) give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency, (iii) are better able to study dynamics of adjustment, (iv) are better capable to identify and measure effects that are simply not detectable in pure cross-section or pure time series data, (v) allow to construct and test more complicated behavioral models than purely cross-section or time series data and thus allow a researcher to analyze a number of important economic questions that con not be addressed using one dimensional data, and limitations, e.g. (i) design and data collection problem, (ii) distortions of measurement errors or (iii) selectivity problem.

A panel data set is formulated by a sample that contains *N* cross-sectional units (individuals, firms, households, countries etc.) that are observed at different time periods *T* [1]. Simple linear panel data model can be written as (2):

$$y_{it} = \alpha + \beta X'_{it} + u_{it} \tag{2}$$

where *y* represents the dependent variable, *X* vector of explanatory variables and subscript *i* denotes cross-section dimension (V4 countries) whereas *t* time series dimension (1999 – 2010), α, β are coefficients and *u* is a random disturbance term. In general, three different methods can be used to estimate linear panel data models by means of ordinary least squares: (i) common constant as in equation (2), (ii) fixed effects and (iii) random effects. The common constant method implies that there are no differences among variables of the

cross-sectional dimension, so-called homogenous panel. Fixed or random effects allow us to capture the differences among units; hence the random disturbance term *u* is given by (3):

$$u_{it} = \mu_i + \nu_{it} \tag{3}$$

where μ_i denotes unobservable individual-specific effect which is time-invariant and is responsible for any individual-specific effect that is not contained in the regression. The random disturbance term *u* from (2) is sometimes expressed as so-called two-way error component (4):

$$u_{it} = \mu_i + \lambda_t + \nu_{it} \tag{4}$$

where λ_t represents individual-invariant and it accounts for any time-specific effect not included in the regression. In case of fixed effect it is assumed to be fixed parameters to be estimated whereas in case of random effect it is assumed to be random and ν_{it} denotes remainder disturbance which varies over individuals and time [3; 14]. But the question, which model is more appropriate still remains.

For common constant and fixed effect model we can apply standard F-test under the null hypothesis (H_0 thereinafter) that all the constants are the same [1]. In random effect model we assume zero correlation between explanatory variables and the unobserved effect. Hausman test [13] is employed to find out if this assumption is fulfilled under H_0: random effects are consistent and efficient.

Moreover, it should fulfill the assumptions for standard ordinary least squares error terms, i.e. the remained disturbance is homoskedastic, serially and spatial uncorrelated. In particular, to avoid spurious regression and misleading conclusions we need to find out, if the panel data are stationary or non-stationary. There are a few methods to find out the data stationary or non-stationary.

For homogenous panel data we employ Levin, Lin, and Chu [17] under the H_0: each individual time series contains unit root (non-stationary) against alternative hypothesis that each time series is stationary. Maddala and Wu [19] proposed alternative approach for panel data based on Fishers's results. This method tests H_0: each individual time series contains unit root against the alternative hypothesis for at least one time series is stationary. All necessary tests are performed at the 5 per cent significance level.

3. Empirical results of panel data model

In this section the results from balanced panel data regression model in the case of V4 countries are presented and discussed. At first we estimate step by step all three models by means of least squares method. In compliance with goal of this paper we examine the relationship between economic growth and human capital. According to above mentioned tests the fixed effect model seems to be the most appropriate model to identify the link among secondary graduates (*secgr*) and tertiary graduates (*tergr*) like the explanatory variables and GDP per capita growth (*gdppc*) like a dependent variable (5):

$$gdppc_{it} = \alpha + \beta_1 \sec gr_{it} + \beta_2 tergr_{it} + \mu_i + \nu_{it} \quad (5)$$

The coefficient of determination (R^2) = 0.93, annual secondary graduates rate and tertiary graduates rate explain about 93 per cent of the variation in GDP per capita growth for V4 countries. The regression model and coefficients are significant at 5 % significance level. The remained disturbance ν_{it} fulfills the assumptions for used methods. The Maddala and Wu [19] test for unit root was carried out and at least one of time series is stationary, thus all of panel data are stationary. When we estimate (5) for each country we get (6) for the Czech Republic, (7) for Hungary, (8) for Poland and (9) for Slovakia. The unobservable country-specific effect μ_i is represented by changes in intercept.

$$gdppc_{CZ,t} = 6.83 - 0.19 \sec gr_{CZ,t} + 0.42 tergr_{CZ,t} \quad (6)$$

$$gdppc_{HU,t} = 6.63 - 0.19 \sec gr_{HU,t} + 0.42 tergr_{HU,t} \quad (7)$$

$$gdppc_{PL,t} = 5.83 - 0.19 \sec gr_{PL,t} + 0.42 tergr_{PL,t} \quad (8)$$

$$gdppc_{SK,t} = 6.57 - 0.19 \sec gr_{SK,t} + 0.42 tergr_{SK,t} \quad (9)$$

The estimated coefficients and signs are in accordance with expectations in case of tertiary graduates but not in case of secondary graduates. The intercept represents the differences among countries. Signs indicate positive link of tertiary graduates' rate and growth rate of GDP per capita. On the other hand, signs indicates negative link of secondary graduates rate and growth rate of GDP per capita. Increasing in secondary graduates about 1 per cent will cause decreasing in GDP per capita growth about 0.19 per cent in the Czech Republic and the other V4 countries as well (ceteris paribus). Similarly, 1 more per cent of tertiary graduates is associated with raising GDP per capita about 0.42 per cent in the Czech Republic and the other V4 countries as well (ceteris paribus). Tertiary graduates increase economic performance and foster national competitiveness also.

The negative link between secondary graduates and GDP per capita could imply i.a. that knowledge and skills are not sufficient and thus there is need for schooling. The lower the level of education the higher unemployment is. Moreover, the ISCED'97 level 3 contains programmes (ISCED'97 level 3A and 3B) that provide direct access to ISCED'97 level 5 while ISCED'97 level 3C programmes lead directly to labor market (for more information see [28]). Next explanation relates to thereinbefore [23] or [10] (for secondary graduates only) or panel data techniques due to more sensitivity to errors measurement.

Conclusion

The main aim of this paper was to investigate the relationship between human capital and economic growth. Annual data for Visegrad group countries (Czech Republic, Hungary, Poland and Slovakia) were employed between 1999 and 2010. Economic growth was quantified as GDP per capita in EUR (2005 constant prices and annual exchange rates). Regarding to disadvantages of expressing human capital by means of investment or expenditure in education, schooling enrollments or average length of education the number of graduates was used. More precisely annual data of secondary graduates (ISCED'97 level 3

and 4) and tertiary graduates (ISCED'97 level 5 and 6). All of the data were collected from Eurostat database and converted into logs.

We found out the positive relationship between tertiary graduates and economic growth. Tertiary graduates increase economic performance and foster national competitiveness also. On the contrary, the negative link was detected between secondary graduates and economic growth. It could imply i.a. that knowledge and skills are not sufficient and thus there is need for schooling. The ISCED'97 level 3 contains programmes (ISCED'97 level 3A and 3B) that provide direct access to ISCED'97 level 5 while ISCED'97 level 3C programmes lead directly to labor market. It confirms statements of [23] or [10] (for secondary graduates only) also or panel data techniques due to more sensitivity to errors measurement.

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Regional Competitiveness from a Macroeconomic Perspective and Within Factors of the Knowledge Economy: A Case Study of the Czech Republic

Abstract
The paper focuses on the evaluation of the role and influence of the macroeconomic environment on national and regional competitiveness in the context of the knowledge economy. These aspects are evaluated from the perspective of the main theoretical approaches defined in recent years. The main reason for this reflection is the authors' attempt to identify the importance of the impact of the macroeconomic environment and trends of strengthening the knowledge economy on regional development. Theoretical approaches are confronted with the progress of strengthening the competitiveness of the Czech Republic within the period 2007 – 2013, which is evaluated at the macroeconomic level within the implementation of the EU cohesion policy. These aspects are then reflected in terms of the challenges and policy-making of the Czech Republic for the following programming period 2014+ and by visions to support regional competitiveness.

Key Words
regional competitiveness, knowledge economy, EU cohesion policy

JEL Classification: E690, R110, R580

Introduction

Developments in recent years have been marked by the financial and economic crisis and have significantly affected the professional discussion on addressing the negative consequences of the crisis on the economies of individual countries and regions. If we disregard the current fiscal crisis some economies are experiencing or the issue of indebted public finances, the crucial point of overcoming the crisis and developing further, strengthening competitiveness, is being increasingly mentioned. Previous analyses of regional competitiveness reflected mainly the microeconomic dimension of individual factors. These topics mainly included a region's attractiveness for investment and skilled population (e.g. Gardiner *et al.,* 2004), the role of cities in regional

competitiveness (e.g. Turok, 2003) or the region's endogenous potential in the sense of the scientific and research potential (e.g. Porter, 1992; Huggins, 2003).

In this context, it is appropriate to ask: what is the current knowledge regarding the influence of macroeconomic developments on national and regional competitiveness? How do the existing theoretical approaches reflect the factors of competitiveness in the environment of the knowledge economy? What is the vision of the European Union for competitive and regionally balanced development for the following period? Is the Czech Republic ready to respond to these challenges? With regard to these questions, we focused our paper on the evaluation of the theoretical and methodological approaches to the topic of regional competitiveness and the possibilities to strengthen it within the framework of the EU cohesion policy. The aim of this paper is therefore to identify the main factors shaping competitiveness at the macroeconomic level in the context of developing the knowledge economy, and consequently evaluate the state and development of strengthening the competitiveness of the Czech Republic through the EU cohesion policy. The authors of the paper compiled conclusions and recommendations for the programming period 2014 – 2020 within a scientific and research project. The results of this project are used by Czech institutions at the national level responsible for cohesion policy in negotiations with the European Commission on the future shape of the policy in the period 2014 – 2020 and its implementation in the CR.

1. Theoretical framework of regional competitiveness: micro- and macroeconomic perspective

Competitiveness of the economy can be generally described as a term that synthetically expresses a country's ability to penetrate foreign markets with its goods and services and to gain comparative advantages from international exchange. A country's economic competitiveness is not a narrowly defined phenomenon that can be measured using one individual indicator of competitiveness; it is rather a complex aspect, some components of which can be quantified and others are qualitative in nature and can be measured directly. Economic development in market economies is clearly connected to the concept of competitiveness as a key measure of the long-term success of companies as well as countries and their regions (Wokoun, 2009, 2010). Much of this concept is applied in the EU cohesion policy, in particular in relation to the labour market, the innovative abilities of companies and the development of business environment (see also Chapter 4).

Papers and analyses on regional competitiveness have so far mainly focused on the evaluation of microeconomic factors that affect this issue, including the establishing of indicators to measure them and to evaluate their underlying fundamental foundations relating to the establishment of terminology. In economic terminology, competitiveness is analysed and perceived as one of the basic sources of regional mobilization and creativity from a microeconomic perspective. This issue was dealt with by Kitson *et al.* (2004), who focused on the concept of "regional productivity" and the determinants affecting it, thus increasing the overall competitiveness of the region. This concept of regional competitiveness was approached differently by Martin and Tyler (2003), who

set the basic question of the sense in which regions compete with each other. These authors have identified three such cases, i.e., regions (1) compete for investment through their regional capacity to attract foreign private and public capital, they (2) compete in the area of workforce and the labour market, they seek to attract experienced and professional employees, entrepreneurs and creative professionals, thereby creating an innovative environment in the local labour market, they (3) compete in the area of technology trying to attract education-based, knowledge and innovation-based activities. According to Boschma (2004), regional competitiveness also depends on historically determined and geographical conditions. Many regions are specific for their accumulated activities and functions which also attract companies with a specific focus. In the long run, however, Boschma considers regional competitiveness a rather unpredictable phenomenon, and therefore he dealt in particular with a general description of the context of the competitiveness of companies and regions, pointing out the need for a knowledge base (know-how, transfer of knowledge between different levels of companies and regions, etc.) and innovative processes. Budd and Hirmis (2004, p. 1023 – 1025) expand further on the above concept of competitiveness by including the perception of regional competitiveness as the cumulative output of a number of different factors and also deal with the capacity of regional competitiveness at macroeconomic level, formulating it especially on the basis of the "X-efficiency" theory. In this theory, Budd and Hirmis point to the important role of external economies in increasing the capacity of regional competitiveness and focus on three types of external economy, i.e. localization economies, urbanization economies, and "activity-complex" economies. The latter, i.e. activity-complex economies, arise from a common location of various activities which are interconnected to a large extent. These three types of agglomeration economy work as an indirect transmission mechanism between the comparative advantages of regional economies and the competitive advantages of companies. The X-efficiency theory in this model represents a conceptual benchmark used to evaluate the efficiency at the company (microeconomic) and national (macroeconomic) level.

The evaluation of the macroeconomic context of the development of competitiveness at the national level is further discussed in the following reports: World Economic Forum (WEF, 2011) which prepares the Global Competitiveness Report (GCR) and the International Institute for Management Development (IMD, 2011) which prepares the *World Competitiveness Yearbook* (WCY). The WCY focuses on the analysis of a larger number of criteria, which are, however, divided into 4 similar groups of factors of competitiveness (these groups are further divided into sub-factors emphasizing aspects of each analysed area). They include economic performance, government efficiency, business efficiency and infrastructure. Both approaches to measuring competitiveness at the macroeconomic level are reflected further in the specific case of the Czech Republic. Jermischina (2008) adds that a region's competitiveness can be understood as the ability to act at an equal level towards other competing entities in the market. She suggests that regional competitiveness is determined both by the presence of competitive industries or their segments, and the ability of regional governments (see government efficiency above) to create the conditions for regional companies to catch up with, and maintain competitive advantages in the relevant areas.

2. Reflection of THE knowledge economy in the competitiveness evaluation of the CR within the EU Cohesion Policy

The basic document of the EU cohesion policy in the Czech Republic is the National Strategic Reference Framework for the period 2007 – 2013 (NSRF), which global objective is "the transformation of the socio-economic environment in the CR in harmony with the principles of sustainable development in order to make the CR an attractive location for investment, work and life of the population.) To monitor the successful performance of this objective, 4 key indicators have been identified that reflect socio-economic development in the Czech Republic (see Table 1 below). It is obvious that meeting the values of these statistical indicators is influenced by a wide range of phenomena, one of them being the cohesion policy interventions through Structural Funds. Therefore, their monitoring should be seen in a broader context.

Tab. 1 Performance of the global objective statistical indicators

Indicator	Unit of measurement	Source	Default value	Target value	Achieved value	Date of value
GDP/cap. in PPS, EU25=100	%	CSO / Eurostat	73.7	EU25 average	78.0	2009*
CGI (Competitiveness Growth Index)	order	WEF	4.74 (29th place)	5.0 (26th place)	4.57 (36th place)	2010
Long-term unempl. rate – total	%	CSO	4.2	reduction of 20 %	3.0	2010
Long-term unempl. rate women	%	CSO	5.2	reduction of 20 %	3.5	2010

Note: As the CSO informed, the conversion of GDP is pending after a new revision . The current value of GDP per capita is 79.7 %, EU27 average

Source: Czech Statistical Office (CSO), WEF

The value of the statistical indicator, "competitiveness growth index", which is monitored by the World Economic Forum, showed a slight decrease for the Czech Republic in the middle of the programming period 2007 – 2013 according to available data, which is mainly due to the economic recession in recent years. Other defined indicators are developing in accordance with the set objectives. It is worth mentioning that the values of long-term unemployment have been, despite an increase in 2010, fulfilled beyond initial expectations, despite the negative impact of the economic crisis in 2008 – 2010. The global NSRF objective is divided into 4 strategic objectives, i.e. Strategic Objective I: Competitive Czech Economy, Strategic Objective II: Open, Flexible and Cohesive Society, Strategic Objective III: Attractive Environment and Strategic Objective IV: Balanced Territorial Development. In relation to the topic of this paper, we shall look more closely at the evaluation of the development of the Strategic Objective I. "Competitive Czech Economy", which aims to promote a competitive business sector, support capacity building for research and development, sustainable tourism and exploit the potential of cultural heritage. This objective also aims to accelerate sustainable economic development through innovation and structural changes in the Czech economy.

Tab. 2 State of performance of statistical indicators for NSRF Strategic Objective 1

Indicator	Unit of measurement	Source	Default value	Target value	Achieved value	Achieved value date
R&D expen. to GDP	%	CSO	1.42	2.2	1.56	2010
SII (Summary Innovation Index)	quantity	EIS	0.26	0.36	0.41	2010
R&D expen. in business sector	% GDP	CSO	0.77	1.5	0.97	2010
Employees in R&D / 1000 empl.	per mille (‰)	CSO	9.1	10.8	10.7	2010
Employees in R&D / 1000 empl. – women	per mille (‰)	CSO	6.9	8.0	7.6	2010

Source: Czech Statistical Office (CSO), European Innovation Scoreboard (EIS)

Gradual achievement of the targets can be shown in statistical indicators for the Strategic Objective I, and a paradox occurs when measuring the competitiveness of the Czech economy. On the one hand, there was a reduction in the index of competitiveness of the Czech economy according to the WEF, on the other hand, the strategic sub-objective focusing only on competitiveness shows a clear strengthening of the Czech economy. The main problem lies in the concept of the appropriate indicators.

The middle of the programming period 2007 – 2013 saw an increase in the value of the monitored indicators of the Strategic Objective I. These include in particular the strengthening of cooperation between the business sector and educational and research institutions, especially in applying research results in practice. Gradually, there is a growing importance of SMEs in introducing innovation arising from the collaboration with research institutions. Their share of the GDP, employment, investment and foreign trade is also increasing. Although these trends are positive, the competitiveness of the CR is not yet based on innovation and private R&D spending is low. This specific aspect can also be demonstrated on an international comparison of the employment rate in the Czech Republic in high-tech and medium-tech sectors on the one hand (the highest in the EU-27), and in knowledge-intensive services on the other (well below the EU-27 average).

The trends in the development of the knowledge economy mentioned above indicate a positive shift in the Czech Republic. The current state of competitiveness is, however, affected by the fact that in the first decade of the new millennium, the Czech Republic significantly focused its economic structure especially on the processing industry, particularly on the production of automobiles, i.e. the prevailing development was concentrated in quality non-intensive segments such as assembly type of operations or slightly more sophisticated work. In 2008, the Czech Republic was placed first in employment in high- and medium-tech sectors among of all EU-27 countries and compared with the EU average, the rate of such employment is almost double in the Czech Republic. To a large extent, the position of the Czech Republic as a slightly more sophisticated "workshop" of Europe has been reconfirmed. On the other hand, concerning the employment in knowledge-intensive industries, the Czech Republic occupies a very below-average position. Employment requiring a mid-level skilled workforce, which is abundant in the Czech Republic, is significantly strengthening. On the other hand, the low share of employment in knowledge industries is related to the

so-far low intensity of innovation activities, which are also strongly regionally differentiated. Generally, the knowledge economy is at a lower level of development in the Czech Republic with competitiveness based on a suitable combination of conditions for sophisticated manufacturing industries (e.g. the level of skill of the workforce, stable, long-term industrial tradition, infrastructure). The Czech economy is therefore in the middle stage of a competitive development towards a knowledge economy, and other related factors must therefore be monitored and evaluated.

In accordance with the theoretical approaches, which are confirmed as valid in practice, one has to revise the approaches to promoting competitiveness. The Czech Republic is now an export-oriented economy specialised in facilitating the customer needs of the Eurozone and other countries. From a geopolitical perspective, it is logical that the largest supply transfers are directed to Germany. The local, especially automotive, industry is at a very high technological level and requires a highly innovative approach to the implementation of sophisticated technologies. In this respect, the Czech Republic faces the challenge of keeping up with the demand for ever-more sophisticated and technically demanding solutions and has to adapt its environment to always keep ahead and maintain its relative geographical advantage despite constantly increasing labour costs in the Central European region. It is therefore recommendable for the Czech Republic to focus its economy on long-term progressive and profitable areas with a strong potential. Among these areas are undoubtedly the automotive industry, computer industry and other industries that require a strong share of knowledge for their growth and competitiveness. It is research and development of new technologies applied in the manufacturing sector which should set the direction of development in this area. Currently, this development is stimulated through the Structural Funds, in particular through two operational programmes aimed at both supporting business (particularly in relation to innovation) as well as at supporting research and development, again particularly in relation to innovation. The synergies of these two operational programmes or the impacts of these objectives should bring real results in the form of competitiveness index growth of the Czech economy in relation to countries outside the Eurozone, as well as in global context.

3. Factors of the knowledge economy and recommendations for the Czech Republic

The Czech Republic has set up a very complicated system of administration due to a high number of operational programmes. These problems appear to be a potential disadvantage for the implementation of measures to increase the competitiveness of the Czech Republic, as the coordination of such a high number of operational programmes without a strong coordinating institution is difficult. These problems must be prevented in the next programming period by setting up a relevant structure and an appropriate number of operational programmes. Another aspect is how the processes of support are set up. After the experience of the current period, we can expect adjustments to the implementation system in terms of its transparency, administrative and financial efficiency and a strong position of the designated coordinating body, in order to facilitate the evaluation of the performance of the support objectives. However, the

resulting set-up of the implementation system of cohesion policy in the Czech Republic will result from political decisions.

The term "competitiveness" represents a broader complex of factors, with the knowledge economy playing an increasingly important role. National and regional competitiveness shapes the business environment, the level of R&D, education system setting, and the overall development of human resources with a focus on the ability to make effective use of information, on creative thinking and choosing the appropriate business model for promoting a product in the market. Given that the Czech Republic operates in a highly globalized environment, it will be necessary and appropriate to maintain and strengthen the existing efficiency-driven factors of the CR, i.e. export oriented high-tech and medium-tech industries, including supporting the development of SMEs. An important area of this group is also the factor of labour market efficiency. To ensure a competitive environment, an efficient labour market should be prioritized by ensuring education and upgrading skills matching the needs of the labour market in the emerging knowledge economy in the Czech Republic.

Shaping the future form of cohesion policy in the Czech Republic is based on the experience of the current programming period, where innovation and aspects of the knowledge economy are supported by national thematic operational programmes. This context offers recommendations for strengthening the innovation-driven factors of the Czech Republic. In the next programming period, emphasis should be put on providing a functioning research and innovation system (including its managing institutions), the effective management of applied research and development, linking entrepreneurs' demand with research institutions' supply and the establishment of new technology companies. The aim should be to strengthen the competitiveness of the economy by increasing business competitiveness with an emphasis on activities directly or indirectly linked to research, development and innovation.

The Czech Republic does not rank among the economically weakest countries in the EU; however, the current quality and scope of basic territorial infrastructure does not yet meet the average standards of West European countries. In this sense, the Czech Republic will have to continue to support some of the unsuitable aspects of the factor-driven competitiveness of the Czech Republic in the following period. The quality, range and the availability of basic infrastructure, represents the basic precondition for national and regional competitiveness. Therefore, completing the backbone infrastructure, ensuring accessibility and sustainable transport using modern technology is vital for ensuring the starting conditions of economic development. Institutional conditions of development and competitiveness are also a part of this group of factors. In line with previous recommendations, it is therefore necessary to put emphasis on improving the quality of functioning of national and local governments. In addition to the knowledge economy, the EC currently places a great emphasis on the "greening of sector development" (e.g. "greening transport" or "greening agriculture"), which should be achieved by a more extensive use of innovation and by generally strengthening the innovative aspects of the relevant policies. In relation to these trends and the European Commission's ideas of future cohesion policy, the Czech Republic must also reflect and adapt its own strategies and development planning the aspects

with a direct and indirect impact on the development of a knowledge economy and on strengthening its competitiveness. Strengthening regional competitiveness should not be reduced merely to the technological area; it should rather cover, as indicated above, all activities and also include educational, social and regional areas. Support should be increasingly provided for research and development centres, and the SMEs.

Conclusions

The paper focused on the evaluation of the role and influence of the macroeconomic environment on national and regional competitiveness in the context of the knowledge economy. Theoretical approaches were confronted with the development of competitiveness of the Czech Republic within the programming period 2007 – 2013. In accordance with the WEF, the basic factors of economic competitiveness were divided by the level of development of each economy to factor-driven economies (institutions, infrastructure, macroeconomic environment, health and primary education), efficiency-driven economies (higher education and training, goods market efficiency, labour market efficiency , financial market development, technological readiness, market size), innovation-driven economies (business sophistication, innovation).

The competitiveness of the Czech Republic was evaluated at the macroeconomic level within the implementation of the EU cohesion policy. The partial aim of this paper was to assess the readiness of the Czech Republic for the application of new challenges in preparing the new programming period 2014 – 2020 in relation to enhancing its competitiveness. Although the paper largely discussed the substantive context of competitiveness within the context of the knowledge economy, we have supplemented our discussion and recommendations with the issue of implementation and the setting of the current system of cohesion policy in the Czech Republic, whose evaluations are important for shaping the future form of cohesion policy on national and regional level.

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Adaptive Control of an Investment Project Risks Based on the Prediction Approach

Abstract

The paper analyzes functioning of an enterprise risk control system in conditions of high uncertainty and influence of the external environment. A mechanism for forming knowledge on risks and cause-and-effect relations for a current moment of realization of an investment project is demonstrated. A prediction approach to project risk evaluation including a process of the current (continued) identification is introduced.
A database structure presenting a data array in a table (matrix) format is developed. The structure is thoroughly described; on its basis the process of systematizing and actualizing the data, renewed formulation of project risks containing information on preceding and current statuses and forecasts are described.

Key Words

external environment, investment project, uncertainty, prediction approach, risk control system, current (continued) identification

JEL Classification: C13, D24, L10, L23, L25, M11, O31

Introduction

In modern conditions a company functions in a complex system of interactions with other business representatives of the world and domestic markets. A company as a control object performs certain actions to execute its competitive strategy efficiently and successfully. During the functioning process the control object is exposed to influence of the external environment which may facilitate or hinder achievement of set goals. Resolution of different economic tasks developed within the competitive strategy is carried out in conditions of increasing political and socio-economic risks, in a favorable or unfavorable market situation, and also with formed prices and harsh competition. These tasks are related to functioning of control objects and systems, performance evaluation and forecasting their activities. In order to realize the goals set within the competitive strategy it is necessary to take into consideration uncertainty of the source information. Solving the task of risk identification under effect of controllable and uncontrollable disturbances from the external environment may serve as an example [1, 2, 3, 4].

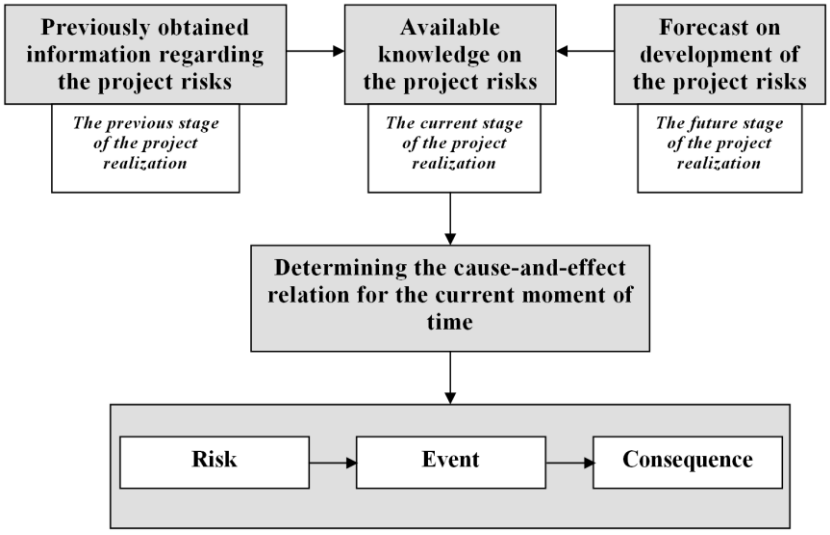
Methods of system analysis basing on ideal models of control objects do not enable to solve this task fully due to the fact that such models simplify initial systems. The typical simplification is to substitute a part of the source information with determined, i.e.

stochastic processes are substituted with mean. Such an approach leads to false practical conclusions.

1. Forming knowledge about risks of an investment project in conditions of high uncertainty

The main aim of a risk-controlling system is to decrease uncertainty within external and internal environments of an enterprise in order to accumulate information about conditions in which an investment project is realized. The initial step in the process of controlling and analyzing risks is to identify them. On the basis of the identification all the risks should be not only revealed, but also documented. The process of risk identification requires gathering reliable information which will later facilitate a detailed analysis of the determined risks – quantitative and qualitative evaluations. Based on the results of the evaluations, it is possible to carry out ranking to demonstrate sources, probabilities and weight of consequences of the risk emergence. Risk identification and the following ranking enable to develop and implement measures to counteract risks that may occur during realization of other heterogeneous projects securing execution of the competitive strategy of an enterprise.

Fig. 1 A mechanism for forming knowledge on risks and the cause-and-effect relation for the current moment of realization of an investment project



Source: author's plotting

However, an enterprise that carries out its activities in conditions of uncertainty and high turbulence of the external environment may lack reliable information on conditions of realizing an investment project in a specific point of time and also on related expenses and financial and economic results. For this reason it is necessary to develop a mechanism that enables to carry out continued risk identification. By means of this approach formulations and evaluations of the risks would be specified for the current (measured) moment. To realize the suggested process of the current identification it is necessary to use the information obtained after revealing risks during the previous stages of a project, available knowledge on risks for the current moment and forecasts of

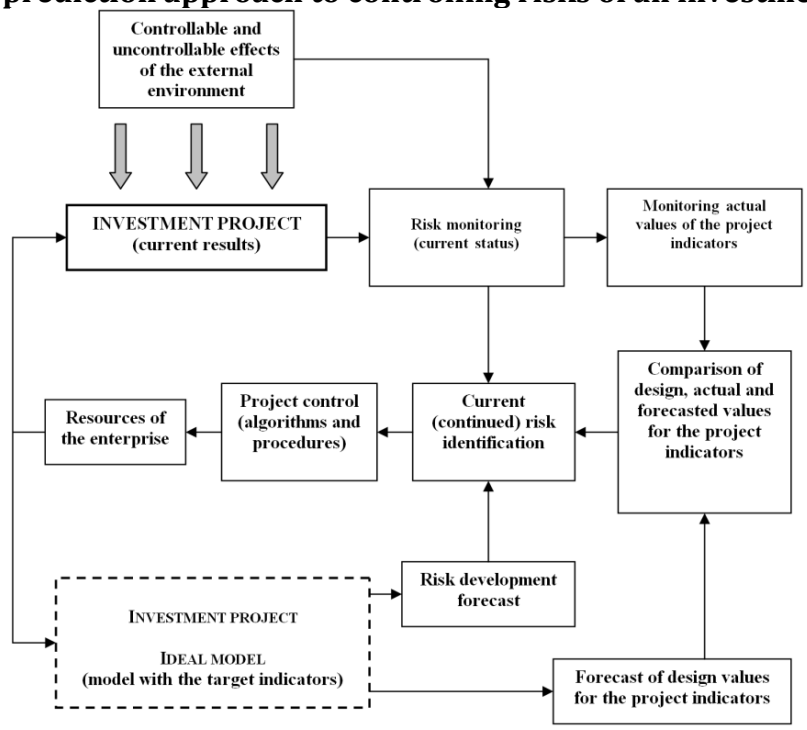
further development of risks. A mechanism for forming knowledge on risks and the cause-and-effect relation for the current moment of realization of an investment project is demonstrated by Figure 1.

In order to formulate reliable flows of information on changes in the external environment and deviations in actual parameters from design values for a specific moment of time we will use the proposed mechanism for forming knowledge on risks (Fig. 1). These deviations should be identified and compensated in time to minimize investment losses, because during the course of the project realization (especially – an innovative project) they may pose a serious threat for an enterprise. Emergence of such deviations is linked in the first place to uncontrollable effect on the project formed as a result of influence of negative factors of uncertainty within the external and internal environments. Positive deviations of project performance indicators from design values should also be identified and realized with maximum benefit for an enterprise [5, 6, 7].

2. The prediction approach to controlling an investment project with continued risk identification.

In order to effectively control deviations emerging during the project realization a suitable approach that can systematize, rank and compensate effects of the external environment on different stages of the project realization is required. This means that effective interconnections and opportunities to continuously evaluate risks in the monitoring mode should be provided within the project control structure in conditions of high uncertainty.

Fig. 2 The prediction approach to controlling risks of an investment project



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Use of such an approach enables to adapt the project control to effects of the external environment. In order to realize the above-mentioned tasks the structure of prediction approach to controlling an investment project is proposed (see Fig. 2).

This approach requires use of current results of an investment project and information about the current status of risks. The model of an investment project (the ideal model) is included into the structure of the prediction approach to obtain calculation data on forecasted values of the project indicators with current resource injections. This model characterizes realization of the project with the set target indicators with current resource injections. Thereby forecasts can be carried out in such conditions where influences of transfer lags in data channels, uncertainty and other uncontrollable (non-measurable) disturbances on realization of a project are eliminated. Taking into account all dangers, this enables to evaluate separately the extent of influence of every negative factor on investment activities of an enterprise in the current moment [8, 9].

Use of the prediction approach increases the amount of more reliable data during the project realization, while actualization of results of observing the project risks provides an opportunity to form in time a rational preventing action to resist risks. Thereby, during determination of the value of expected earnings and weight of a risk it is necessary to identify emerging risks using:

- input indicators of the project (material, financial, intellectual and other types of resources, as well as information on influences of the internal environment);
- output indicators of the project (cash flows, net discounted earnings, internal rate of return and other performance indicators);
- the value of the lag in data channels of input/output indicators of the project;
- controllable and uncontrollable influences of the external environment.

3. The algorithm for the method of current (continued) risk identification

On the basis of the prediction approach the emergence of the risk of nonreceipt of expected earnings may be forecasted in conditions of high uncertainty and turbulence of the external environment by means of such element as “Current (continued) risk identification” (Fig. 2) with use of a respective method [4]. Carrying out continued identification requires use of information obtained during revealing risks on the previous stages of a project and its comparison with available knowledge on current risks obtained during the observation process (Fig. 1).

Comparison of these results and forecasts for future risks development specifies the cause-and-effect relation in the current moment of time between a risk factor, an event that may occur as a results of the risk and a consequence of the event. Increasing precision of cause-and-effect relations leads to actualization of the results of observations of the project risks. The flowchart characterizing the method of current

(continued) identification within the structure of the risk control of an investment project is shown in Figure 3.

The prediction approach to risk evaluation in the process of controlling an investment project enables to create a new formulation for a risk which contains such elements as retrospection (data on the preceding status), current status and forecast. Thereby, experts or project groups having more current and antecedent information. This information is prepared and systematized on the basis of the proposed approach and the method of current identification for the management of an enterprise on a short deadline the database that presents the data array in a table (matrix):

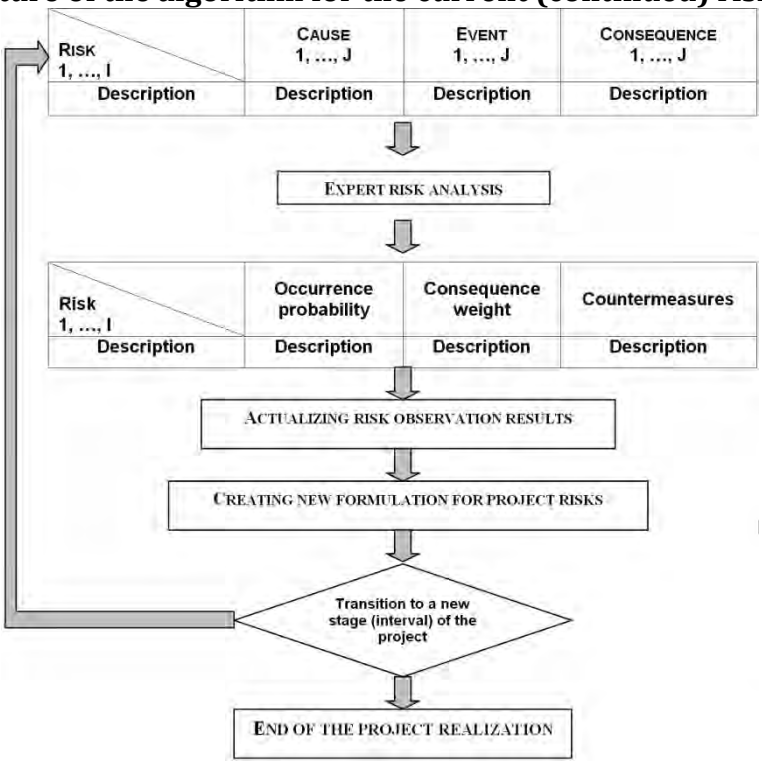
1. Data on correlations between a risk factor and causes for its emergence (specification of the cause of the risk emergence with description of an existing project factor that leads to the risk). Matrix: [Risk factor (i) / Cause (j)].
2. Data on correlations between occurrence of a risk factor and emergence of undesired events (determination of origins of undesired events that may lead to the risk occurrence). Matrix: [Risk factor (i) / Event (j)].
3. Data on correlations between a risk factor and emergence of negative consequences (instantiation of negative consequences cause by the risk emergence). Matrix: [Risk factor (i) / Consequence (j)].
   Data on correlations of a risk factor with the probability of the event occurrence, the weight of consequences and countermeasures (granting full information on dynamics of changes within the risks structure, probability of emergence of risk events and weight of their consequences for taking countermeasures against risks). Matrix: [Risk factor (i) / Probability of risk events occurrence (i); Weight of consequences caused by the occurred event (i); Risks countermeasures (i)].
   where: i –number of a risk factor ($i = 1, \ldots, I$); I – number of risk factors on a specified stage (interval) of a project; j – number of an analyzed (evaluated, design) factor correlated with a risk factor ($j = 1, \ldots, J$); J – number of analyzed (evaluated, design) factors on a specified stage (interval) of a project.

Tables (matrixes) of data are formed via comparison of knowledge on risk development at different project intervals and application of data on preceding status, current status and forecasts for each stage t of a project and for each identified risk i and correlated factors j. Depending on unique features of an investment project, experts have an opportunity to develop on each stage of a project ($t = 1, \ldots, T$; where T – duration of a project in intervals or stages) recommendations both on the basis of the tables (matrixes) and by means of the risk observation vector X_i ($i = 1, \ldots, I$) that we propose. The vector looks as follows: e.g., for $t = 1$, Xi = [Cause (1), … , Cause (J); Event (1), … , Event (J); Consequence (1), … , Consequence (J); Probability of risk event occurrence (i); Weight of consequence (i); Risks countermeasures (i)].

During realization of the following stage (time interval) of a project the sequence of the actions of the continued identification process within the structure of risk control for the current stage ($t=2$) is repeated (iteration is carried out) be means of the suggested approach. On the basis of the newly-acquired identification data the observation vector X_i is actualized, a new formulation for a project risk containing information about

preceding and current statuses as wells as forecasts is defined. The procedure of the method is iterated until the end of the project realization. The structural scheme of the method of the current (continued) risk identification is shown in Figure 3.

Fig. 3 The structure of the algorithm for the current (continued) risk identification



Source: author's plotting

Conclusion

The proposed predictor approach to controlling risks enables executives to design an adaptive enterprise management system for the situation of high uncertainty. As this risk control system creates effective information supply, decrease in uncertainty enhances characteristics of an investment strategy of an enterprise. It is achieved through an opportunity to obtain information on risk development on the early stage of their occurrence.

It is crucial that risks are ranked according to results of qualitative analysis. Therefore, excluding negligible risks and risks that are uncontrollable in the current moment of time, experts reduce by means of the proposed approach and qualitative analysis the number of risks to be analyzed quantitatively with complex mathematical calculations. Due to a feedback system integrated into the risk control system the prediction approach enables experts to receive early signals on emergence of cause-and-effect relations not only between stages of a single project, but also between a number of investment projects sharing interrelated indicators.

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Influence of Supply Chain Management on the Growth of the Market Value of a Company

Abstract

The article looks into the influence of supply chain management on business processes and financial performance of a company in conditions of a saturated market and increasing competition. The necessity of creating competitive advantages via transformation of the supply chain management subsystem from a cost center of an organization into a profit center is substantiated. The potential groups of competitive advantages formed by the supply chain management subsystem are identified. Peculiarities of integrating the supply chain management strategy into the strategy of growth of the market value of a company are analyzed.

The authors suggest decomposition of Free Cash Flow to Firm as a method to identify the key drivers within the supply chain management subsystem that affect the market value of a company. The influence of the subsystem on the drivers is analyzed. On the basis of the analysis the indicator core of the supply chain management subsystem is proposed to develop the future framework for increasing the market value of a company via specific controlled actions on the elements of the indicator core.

Key Words

competitive strategy, cost centers, free cash flow to firm, market value of a firm, profit centers, supply chain management subsystem

JEL Classification: G32, L10, L21

Introduction

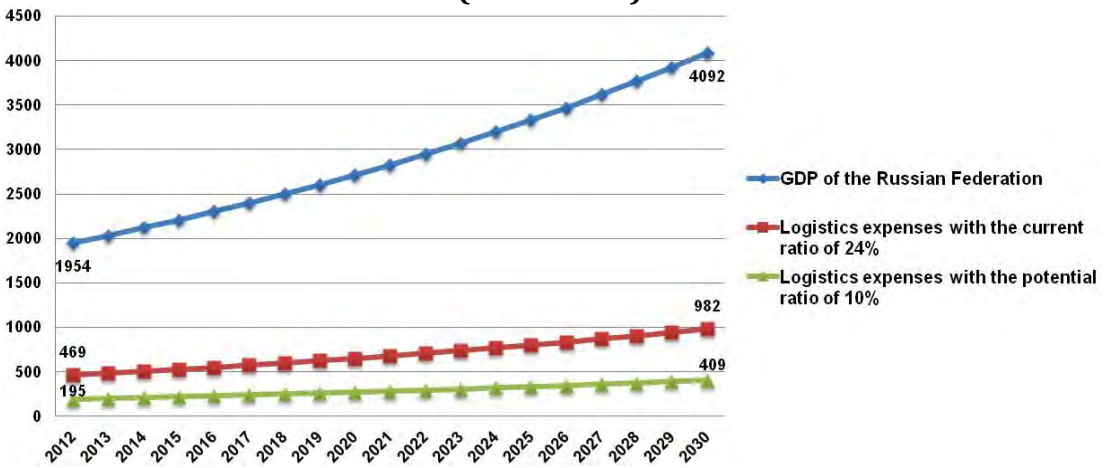
In conditions of globalization and growing competition a particular emphasis is put on efficient management of limited resources that are available to economic players. Saturation of consumer demand curbs opportunities for increasing the market value of a company exclusively by means of expanding the client base. In this situation companies face the necessity to create competitive advantages on the basis of the intensive approach, i.e. by using more efficiently material, financial, informational, intellectual and other resources. Achieving such advantages is possible through reengineering of business processes within continued adaptation of the strategy to the changing environment.

Improvement of the strategy of the market value growth of a company requires analyzing cost centers existing in a company. The analysis aims at:

- revealing wasting in the analyzed structure and defining measures to eliminate it;
- identifying opportunities for transformation of a functional subsystem from a cost center into a profit center.

Many organizations regard supply chain management (often referred to as "logistics") as a supportive subsystem and one of the major cost centers within its business activities, while it has high potential as a profit center. Experts estimate that the share of logistic expenses in the GDP of the Russian Federation in 2012 amounted to 20 – 24 %, while this value is only 10 % in developed countries [1]. According to research of the Organization for Economic Cooperation and Development (OECD), by 2030 the world economy would grow 2 times up to USD 150 trln [2]. If the current distribution of countries within the world economy holds, then the GDP of the Russian Federation with the current share of 3 % will reach USD 4 trln. Therefore, by 2030 logistics expenses in the Russian Federation will be from USD 820 bln up to USD 980 bln. The potential for decreasing expenses in the logistic sphere by 2030 will be from USD 400 bln to USD 570 bln (see Fig. 1).

Fig. 1 Logistics expenses in the structure of GDP of the Russian Federation (in bln. USD)



Source: authors' calculations, [1], [2], [3], [4]

Therefore, it is topical to research into supply chain management (SCM) to find areas that enable the management of a company to increase its competitiveness. The paper looks into SCM as a factor of forming competitive advantages, analyzes influence of SCM on securing sustainable growth of the market value of a company, suggests key indicators for realizing this strategy, and also defines the future framework for improving the indicators.

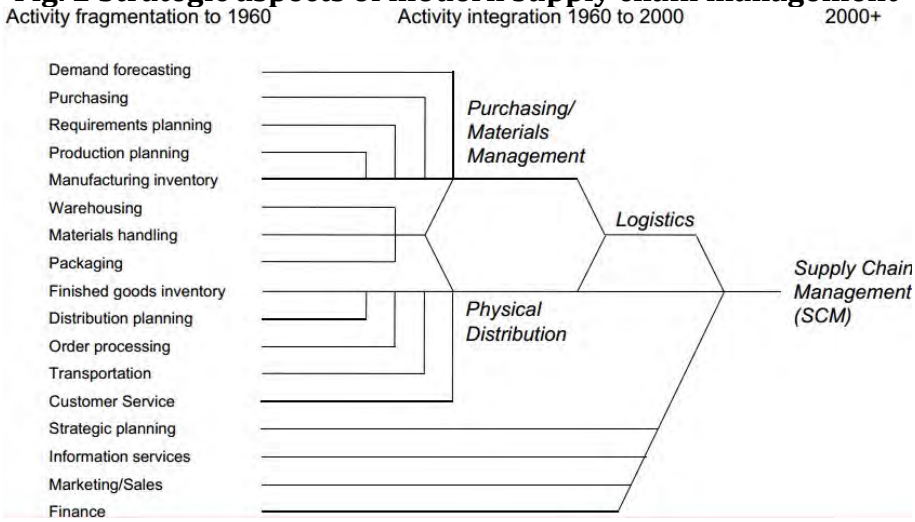
1. Supply Chain Management as a factor forming competitive advantages for an organization.

Increasing competition, being the result of consumer demand saturation, and growth of operational expenses lead to the necessity to seek for and create competitive

advantages. It is possible to distinguish 2 approaches to creating advantages – extensive and intensive. The extensive approach requires enhancing market positions of a company by means of broadening the product range, increasing production capacity and marketing budget, penetrating new geographic markets – i.e. it is linked to accelerating investment spending. The intensive approach to creating competitive advantages requires efficient utilization of all resources by eliminating wasting within business processes. In conditions of limited resources it is more rational to follow the intensive approach as it enables a company to identify and eliminate expenses related to functioning of an organization and to reallocate the "freed" resources to expanding the scale of activities. Therefore, application of this approach creates conditions for decreasing the impact of market volatility on a company via diversification of its business.

Traditionally SCM is regarded purely as physical distribution of goods and establishing sustainable relationships with suppliers and customers [5]. Within the structure of a company it is viewed as a cost center, i.e. aggregate of supporting business functions that are required for maintaining those processes that directly generate profits. Thus, constant cost reduction is chosen as the key performance indicator for this subsystem creating conditions for a conflict between cost cutting and simultaneous high level of services for internal (other subsystem of a company) and external clients. However, there is an inevitable constraint for the SCM subsystem – a threshold for the cost reduction potential.

Fig. 2 Strategic aspects of modern supply chain management



Source: [1]

On the other hand, Supply Chain Management is "the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and the supply chain" in order to enhance the strategic position and performance of a company via creating competitive advantages for it and added value for partners [6]. The strategic role of SCM as a subsystem affecting multiple business processes is presented in Figure 2.

Therefore, SCM involves devising cross-functional decisions in both strategic and operational spheres of the enterprise management. Table 1 provides the range of decisions that SCM may include, but is not necessarily limited to.

Tab. 1 Strategic and operational decisions within supply chain management

Strategic decisions	Operational decisions
Production planning Requirements planning Establishing long-term partnerships with key accounts Allocating warehousing facilties (including openings and closures) Identifying necesseties for investments into property, plant and equipment Taking part in designing strategies for implementing process and product innovations	Managing inventory levels Quality control Coordinating internal logistics processes Co-implementing process and product innovations Managing inbound/outbound orders Managing customer claims Maintaining and improving Key Performance Indicators (e.g., Time of Order Execution, Order Fulfillment Ratio, etc.)

Source: own

Modern approaches to creating competitive advantages require transformation of the SCM subsystem into a profit center. A necessary condition is developing such strategy for this subsystem which takes into account interdependencies with other functional subsystems of a company and creates conditions for sustainable synergetic cooperation [7]. Within improvement of the competitive strategy aimed at growth of the market value of a company it is necessary to develop new ways to add value for clients in order to expand and retain the client base and also to identify potential spheres of process optimization in the SCM subsystem. SCM has potential as a factor forming competitive advantages for a company as it links all subsystems of an enterprise through a set of material, informational and financial flows. There are three main groups of advantages created by the effective SCM:

- cost reduction;
- client base expansion;
- client base retention.

The SCM subsystem has significant potential for cost reduction by elimination of wasting in process of working capital management. For instance, analysis of resource consumption enables to decrease excessive reserve inventory. Application of optimization methods is an essential part of developing complex strategic decisions on necessity and allocation of specific elements of a distribution system. As a result, wasting in forms of underused warehouses and unreasonable investments into property, plant and equipment is eliminated.

By optimizing logistic nodes and flows a company may increase geographical market saturation and therefore maintain the growth of the client base. Apart from that, lower Time of Order Execution enables to cover more clients, while higher Order Fulfillment Ratio serves as one of the factors forming such intangible asset as “goodwill” of a company.

Activities of the SCM subsystem are aimed towards both attracting new clients and maintaining long-term partnership with current key accounts. Simplification of interactions, improvement of service quality with partial transaction of economies to key accounts enables to maintain the current client base. Therefore, increase in performance efficiency of the SCM subsystem enables to maintain the profit growth by reducing costs and expanding influence zones of a company. The above-mentioned competitive advantages in combination have positive effect on the market share and value of a company.

Effective integration of the SCM strategy into the strategy of growth of the market value of a company requires designing an indicator core. An indicator core is an aggregate of basis elements of a subsystem that would be controlled in order to maximize efficiency of realizing a particular strategy. For the strategy of growth of the market value it would require identification of financial and economic parameters and elements of the market value of a company that the SCM subsystem can influence. The next step is to break down the parameters into constituent manageable elements and select those that will form the indicator core for the SCM subsystem. The final result of integrating the SCM strategy is a set if parameters and necessary tools to control the indicator core.

2. Influence of the Supply Chain Management subsystem on Free Cash Flow to Firm as the main driver of the market value of a company.

In order to select the required parameters that will form the indicator core for SCM within increasing the market value of a company it is necessary to analyze composite elements of the market value. In conditions of growing competition and turbulence of the external environment it is rational to calculate the market value of a company on the basis of the formula of variable growth rates [8]:

$$\text{Value of the firm} = \sum_{t=1}^{t_1} \frac{FCFF_0 \cdot (1+g_1)^t}{(1+WACC)^t} + \frac{\dfrac{FCFF_0 \cdot (1+g_1)^{t_1} \cdot (1+g_2)}{WACC - g_2}}{(1+WACC)^{t_1}}, \quad (1)$$

where $FCFF_0$ – Free Cash Flow to Firm in zero period, t_1 – number of periods with the constant growth rate g_1 of FCFF, $WACC$ – Weighted Average Cost of Capital, g_2 – the changed growth rate of FCFF.

As FCFF is a key driver of the market value of a company it is necessary to decompose it into the constituent elements and define those that the SCM subsystem can directly influence.

$$FCFF = NI - Capex + DA + Interest \cdot (1 - Tax\,rate) - \Delta WCR, \quad (2)$$

where NI – net income, $Capex$ – capital expenditures, DA – depreciation and amortization, ΔWCR – changes in working capital requirements.

Within the formula (2) there are 3 main indicators subject of influence of the SCM subsystem: net income, capital expenditures and changes in working capital requirements.

2.1 Analysis of influence of the SCM subsystem on net income of a company

The SCM subsystem influences directly revenue of a company because it links clients and a production subsystem through production planning. Attraction and retention of clients is carried out within the SCM subsystem via creating added value for them by: increasing quality of services; identifying unsatisfied demand and new requirements to existing products; informing the top management on potential for the market share increase.

$$\text{Net Income} = \left(Revenue - COGS - SGA - DA - IntExp\right) \cdot \left(1 - Tax\ Rate\right), \quad (3)$$

where *COGS* – cost of goods sold, *SGA* – sales, general and administrative costs, *DA* – depreciation and amortization, *IntExp* – interest expenses (income).

COGS and SGA are also influenced directly by the SCM subsystem as it is responsible for material resource purchasing, analyzing demand for human resources within the elements of the subsystem, utilization and servicing of the equipment and making decisions on establishing contacts with suppliers. The SCM subsystem indirectly affects depreciation and amortization as it has a significant influence on investments in property, plant and equipment (PPE). However, this parameter is dependant on accounting policies of a company. Interest expenses are also indirectly affected by the SCM subsystem depending on the required investments into assets that are used by it.

On a strategic level the SCM subsystem can have some impact on the corporate tax due to allocation of production and distribution facilities in different countries. However, asset allocation decision is made on the level of top management. Therefore, net income analysis demonstrates that the SCM subsystem has direct influence on revenue, COGS and SGA and indirect on depreciation, amortization and interest expenses.

2.2 Analysis of influence of the SCM subsystem on capital expenditures of a company

In order to analyze the influence of the SCM subsystem on capital expenditures of a company it is necessary to decompose the parameter “fixed assets” into main elements:

$$\text{Fixed Assets} = PPE + IA + LTI, \quad (4)$$

where *PPE* – property, plant and equipment, *IA* – intangible assets, *LTI* – long-term investments.

The SCM subsystem can significantly influence capital expenditures into PPE and intangible assets by providing information and optimizing solutions on allocation of product facilities, distributional centers, hubs, warehouses and establishing a material and information flow management system between the elements. Moreover, by receiving data on consumer demand it can affect investments into equipment and capacity of the elements.

2.3 Analysis of influence of the SCM subsystem on working capital of a company

Working capital requirements demonstrates changes in accounts receivable, inventory and accounts payable in comparison with the previous corresponding interval.

$$\Delta WCR = \left(A / R_0 - A / R_1\right) + \left(Inv_0 - Inv_1\right) - \left(A / P_0 - A / P_1\right), \quad (5)$$

where *ΔWCR* – changes in working capital requirements, *A/R* – accounts receivable, *Inv* – inventory, *A/P* – accounts payable.

The SCM subsystem may achieve high effectiveness in managing working capital due to decreasing and maintaining inventory on minimal levels by means of implementing innovative logistics techniques (e.g., Lean Logistics and Just-in-Time). Reduction of accounts payable can be carried out by revising the value of Days Sales Outstanding, while accounts payable may be increased by working with partners who allow for a high Days Payable Outstanding. Therefore, a company could finance its accounts payable later with earlier accounts receivable. The analysis of FCFF enables us to form the indicator core for the SCM subsystem. The indicator core would consist of the following elements: revenue, COGS, SGA, investments into PPE and intangible assets, and working capital.

Conclusion

The paper has identified the potential of the supply chain management subsystem as a factor forming competitive advantages within a saturated market and influencing the market value of a company. Free Cash Flow to the Firm has been selected as a key constituent for calculating the value of a company. FCFF has been decomposed into elements linked to functioning of the SCM subsystem. The key elements of the SCM subsystem that can be used for ensuring the growth of the market value of a company have been identified. On the basis of the identified elements an indicator core was proposed.

The formed indicator core can be used as a basis for realizing the strategy of growth the market value of a company. It provides the key elements that can be controlled to a certain extent by the supply chain management subsystem. Required control actions on each of the elements vary significantly, depending, first of all, on the uniqueness of a business model of a company and changes in the external environment. Although

controlling all the elements of the indicator core in practice presents as a challenging task, the core could be used in different conditions by partial management of those elements that would maximize the effect in existing circumstances. The next step within the research in this sphere is to provide tools for efficient management of the indicator core.

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A Statistical Analysis of the Support for Small Business as a Solution for Unemployment in the Region Ústí nad Labem

Abstract

The region Usti is widely known for its problems connected with its high unemployment. This fact was the main reason for choosing the topic of our survey. The way out of unemployment does not have to be just finding a new job, but also business. However, people often have fear of entering the sphere of business. They have fear of the risks associated with business, they don`t have the necessary finance, they lack experience and are discouraged by the excessive administration associated with it. And most importantly, important information connected with business is not readily available and people do not even know where to access it. The aim of the survey was to determine the level of awareness and interest in various support schemes and the scale of willingness to tackle unemployment by means of entry into the business world.

For this purpose, we used various statistical methods to verify the relationships between the observed aspects and to find factors influencing people's decision to start a business. It was found that awareness of the aid offered is very low. Individual supports are not very widespread. It was also found that most people do not consider entrepreneurship as an alternative to a job in dealing with unemployment. On the other hand, it was found that most of the existing small business owners are more or less satisfied with their situation, and that do not regret their decision to start a business.

Key Words

data analysis, unemployment, small business, aids, willingness to business

JEL Classification: C12, J60, L26, P33, R58

Introduction

Those just entering the business world and those already in active in it can utilize different forms of assistance within the European Union. They can apply for financial support in the form of subsidies from the EU structural funds, or avail themselves of other benefits such as tax breaks, subsidized loans, etc., in the implementation of their business plans and projects (see websites backed by the European Commission, see [9]).

For example, 15 programs were approved by the Government and subsequently by the European Commission under the Operational Programme Enterprise and Innovation for the period from 2007 – 2013 to support mainly small and medium-sized enterprises.

Information concerning this issue is available at [11]. EU regional support has a significant and positive impact on the growth performance of European regions [2].

Business support does not take place only at the EU level, but also within the Republic and regions. In the Czech Republic, this area is regulated by Law No. 47/2002 Coll. dealing with the promotion of small and medium enterprises and Act No. 301/1992 Coll. and by the Economic Chamber of the Czech Republic and Agricultural Chamber of the Czech Republic (details in [11]).

Entrepreneurs can also find support especially in regional offices. As stated in [10], the budget of the Usti region can be obtained from earmarked funds in the form of subsidies within the announced subsidy programs, subsidies received from donations, the patronage of county officials or emergency assistance. Some of the events and activities of organizations surrounding this, are not covered by grant programs from the Usti region, and can be financed out of the Usti Region Fund. Information on this topic is provided [10].

1. Methodology

The author of article [4] deals with a similar theme of supports. Our aim was to find out how familiar Czech citizens are and especially small entrepreneurs with the supports available and their application and how satisfied they are with the business, and whether they think that the state and Europe support small entrepreneurs sufficiently. Among other things, we were interested which groups of respondents (according to age, gender, educational level attained, employment situation, etc.) are willing to start a business, which area they think the most appropriate for the business, which obstacles in business they consider to be the most important. We were interested in whether the respondents know about the existence and application of some business support and what form of aid would be interested. The survey should help to form an accurate picture of the supports available and to decide how to help small businesses stay on the market and to improve the awareness of these support structures.

Fig. 1 The age of respondents

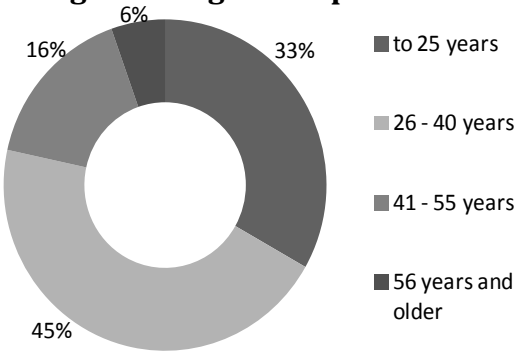
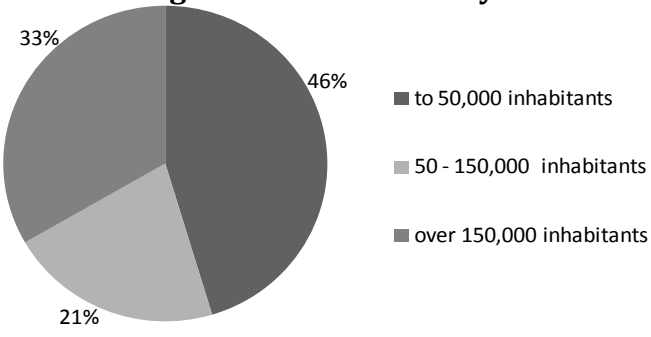


Fig. 2 Size of community

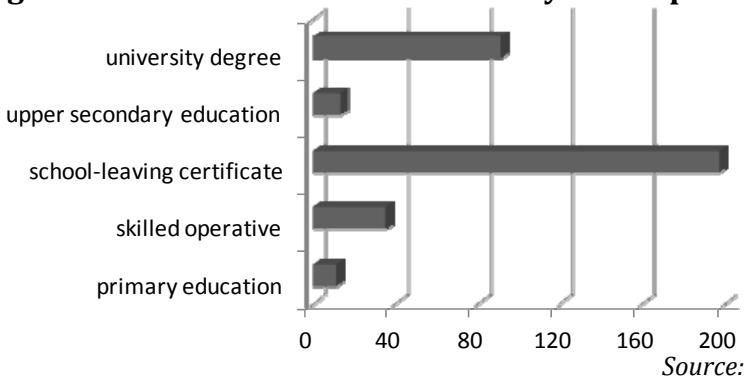


Source: Own primary research

The data accumulation was carried out in the period between 04/2012 – 01/2013. Many municipalities of the Usti region were visited and questionnaires were distributed there

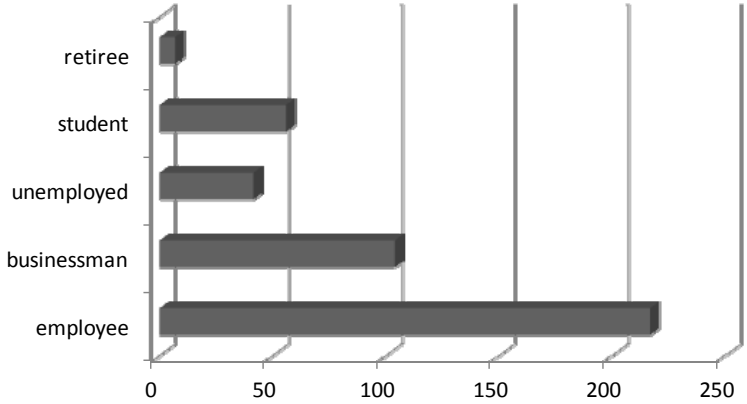
with the help of the students from our faculty. Questions were posed to both inhabitants and businessmen were asked. Some respondents from Prague were asked for the sake of comparison. In the survey in which 836 respondents participated, 42.9 % of respondents were male and 57.1 % women. The structure of respondents from different perspectives is evident from the graphs in fig.1 to 4.

Fig. 3 The level of education attained by the respondents



Source: Own primary research

Fig. 4 The work situation of the respondents



Source: Own primary research

The attained data from the quantitative research were processed by means of the application of statistical methods implemented in Microsoft Excel or in the SPSS statistic system. These issues and methods are described in more detail for example in [7] or [8].

2. A closer examination of factors influencing the willingness to start up a business

We applied the chi-square test of independence in order to find the effects of the willingness to start up a business. We worked at the 5% significance level. The null hypothesis represented the independence in all cases. The resulting p-values are given in Table 1.

Tab. 1 The p-values of the Chi-test of independence

variables	p-value	variables	p-value
willingness – age	$5.39453 \cdot 10^{-05}$	present work situation – priority	$7.10447 \cdot 10^{-09}$
willingness – present work situation	$4.56036 \cdot 10^{-07}$	age – priority	0.385084043
willingness – gender	0.023322432	gender – priority	$1.20321 \cdot 10^{-06}$
willingness – field	0.118391944	attained education level – priority	0.018846549
willingness – opportunity of support	0.060247525	support – education	0.123557594
willingness – level of support	0.238351219	forma – field	0.118710197

Source: Own primary research

The factors as to whether a relationship exists between the willingness to start up a business and the age group to which the respondents belong, the present work situation, the gender, the field of study, which is, according to respondents, the most suitable for business were examined. We examined the dependents concerning the of respondents' awareness of the possibilities of business support and the attitude of the respondents as to the level of business support. Another block of tests dealt with identifying the relationship between the preference for employment before a business on individual aspects, e.g. depending on the present work situation, age, gender, level of education attained. Another test is devoted to examining the degree of dependence on the view of the level of business support and educational attainment. Dependence was also examined for preferred forms of business support on the field of business, which seemed the most promising to the respondents.

The test showed not only that the dependence of willingness to take on the age exists, but it is also very strong. The survey showed that most of the respondents willing to do business were people under the age of 25 years. The willingness to engage in business is highly dependent on the current employment situation of respondents. Businessmen as well as students had the highest willingness to be involved in business from all the respondents surveyed. Furthermore, a positive correlation between the willingness to do business and the sex of the respondents became apparent. Male respondents were more willing to enter. It can be assumed that this is due to the fact that risk taking is more characteristic for men, whereas women prefer security and certainty (at least to some extent) which is provided by employment. Dependence on the field, which is, according to respondents, the most suitable for business, at the 5% significance level was not demonstrated. Independence in this case, is possibly caused by the fact that even though the field is attractive for respondents attractive, they would not be willing to face such risks, requirements or competition for business in this area. No dependence was shown for the willingness to start up a business on awareness of business support. Dependence has not been demonstrated also in the following test, which examined the dependence of the willingness to do business and the respondents awareness of the level of business support. The survey shows that the vast majority of respondents, it seems think there is insufficient business support, but do not have any personal experience with it or know about it at all. This may be the reason why this aspect when deciding whether to start up a business or not, is not taken into account. A strong dependence has been shown to exist between the preference for employment prior to starting up the business and the current work situation of the respondents. The results

only confirm the assumption that most of the respondents prefer a job whose are at present employed, and only a small number of people are already active in the entrepreneurial sphere. In contrast, prioritizing job or running a business was not dependent on the age of the respondents in the survey. If you can talk about the gender of the respondents, a very strong dependence was shown. This result corresponds with the conclusion of the test about the dependence between the willingness to enter business and gender. Here, it was confirmed that women prefer more jobs, while men are more willing to go into business.

The test revealed even the relationship between preference for employment rather than undertaking business and attained educational level. The dependence was not demonstrated between the opinion of the level of business support and educational level attained. The preferred form of business support was that in the field of business which appeared the most promising to the respondents.

3. Exploration of barriers affecting their willingness to business

The parametric tests two-sample F-test of equality of variances and the Independent two-sample t-test were used to determine the relationship between variables for questions where respondents rated the range of obstacles in the business by means of a scale. The tests were performed at a significance level of 5 %.

Tab. 2 The p-values of the F-test and t-test

question	p-value		question	p-value	
	F-test	t-test		F-test	t-test
willingness – risk	0.376183	0.406625	employment – risk	0.164947	0.064868
willingness – finance	0.196072	0.179502	employment – finance	0.461639	0.329240
willingness – admin. complication	0.447225	0.283343	employ. – adm. compl.	0.303547	0.480034
willingness – uncertain earnings	0.228776	0.263252	employ. – unc. earn.	0.308147	0.182442
gender – administrative compl.	0.288672	0.000527	gender – unc. earnings	0.142596	0.008542
gender – risk	0.292569	0.217751	gender – finance	0.405237	0.858328

Source: Own primary research

We were interested in the relationships between variables and the willingness to enter business on some individual assessments of business barriers. Furthermore, obstacles to entrepreneurship were compared in relation to prioritizing employment or the running of a business. This was followed by a group of tests, comparing views on the obstacles in involved in business for the employed and unemployed respondents. The last group of tests gave views as to the barriers to business men and women. All resulting p-values of the tests are summarized in Table 2.

The interviewed persons willing to business assessed the barriers to entrepreneurship as well as those who want to do business. At a significance level of 5 % the statistically significant difference in variance was demonstrated in the case of the obstacle arising from a lack of available space. Which means that people, who are willing to do business, answered with more contradictory views in this area than people, who do not want to do business.

Those respondents who prefer an employment situation to running a business, had comparable views as to all these obstacles to entrepreneurship rather than those respondents who do not favour a job. The difference in mean values was not reported at a significance level of 5 %, but the difference in mean values was shown at the 10% significance level when the obstacle is the risk of failure. It can be assumed that the difference in risk of failure evaluation obstacles between the employed and businessmen is only slight. Each sex perceives differently the obstacles such as administrative complexity and uncertain earnings. The mean of values of women regarding obstacles such as administrative complication was higher than in the case of men. It can be argued that the questioned women compared with men, consider this barrier to be less severe. The mean value is lower in women than in men for the obstacle such as uncertain earnings. The barrier of uncertain earnings was more severe in case of the female respondents rated.

4. Exploring the satisfaction level among already active small businessmen

First, we tested the correlation between physical and psychological satisfaction, but also financial satisfaction with regard to gender. Furthermore, we tested whether respondents' satisfaction with business does not depend on educational level. In the same way, we tested the relationship between the level of satisfaction and the size of the municipality in which they operate. Entrepreneurs in larger municipalities expected to have a somewhat simpler situation, and therefore could be happier. We followed the satisfaction level with regard to financial side, depending on the size of the municipality in which the interviewee did business. Another assumption was that education affects the level of knowledge surrounding the options for enterprise support systems. We also examined the influence of past usage of support on the part of small and medium enterprises whether they would be willing to use it in the future. The assumption was that an entrepreneur, who already had used business support, possesses a far better knowledge of support systems available. He knows how to get support and what will bring him profit, therefore, in the future will have a greater interest in the use of other business support. Vice-versa, the entrepreneurs, who had never used support system, had less knowledge about it and less interest in support in general. We examined the degree of influence resulting from the physical and psychological aspects to the level of satisfaction from the financial point of view. To evaluate the hypothesis, we again used the chi-square test of independence. We worked at the 5% significance level and the null hypothesis was formulated resulting from the independence of factors. The resulting p-values are given in Table 3.

Tab. 3 The p-value of the Chi-square test of independence

variables	p-value	variables	p-value
physic+psycho. satisfaction – gender	0.58942	fin. satisfaction – gender	0.69167
physic+psycho.satisfaction – attained education level	0.86784	fin. satisfaction – attained education level	0.56314
physic.+psycho.satisfaction – size of the municipality	0.72787	fin. satisfaction – size of the municipality	0.96709
support in past – support in future	0.31402	attained education level – knowledge	0.93362

Source: Own primary research

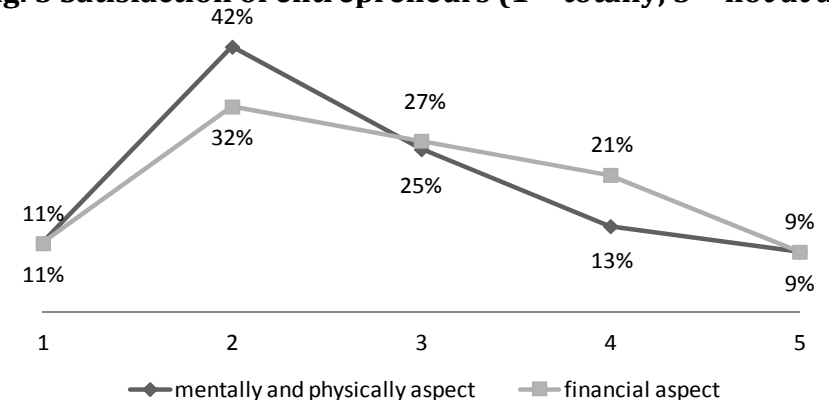
The influence of gender on satisfaction in doing business from the physical and psychological aspects, but also a level of satisfaction with doing business from the financial point of view has not been demonstrated. So both men and women answered this question similarly. Men and women revealed a similar view as to the satisfaction level of both the studied aspects. There was no dependence of the physical, psychological and financial satisfaction arising from the education. Thus, respondents have similar views with regard to satisfaction, whether they have basic, secondary or tertiary level of education. Our assumption that education affects satisfaction was not confirmed.

Satisfaction in both respects is comparable across all groups of attained level of education. Satisfaction with the business is not dependent on the size of the village, where the respondent operates. The assumption that entrepreneurs in larger communities were more satisfied was not confirmed. Another result is the independence of structure according on the respondent`s knowledge of support system from the level of education. That is, if the entrepreneur knows or does not know about the availability of business support is the same across all achieved levels of education degree. Again a presumption was not confirmed. The structure of respondents arising from the use of support in the past does not affect the possible use of subsidies in the future.

5. Exploring the contexture of satisfactions in both aspects

We applied the Friedman test to show the contexture of satisfaction in both observed aspects. The null hypothesis represented the independence of them. The resulting p-value was equal to $1.7 \cdot 10^{-5}$. The level of physical and psychological satisfaction on the part of entrepreneurs was shown as well as the dependence on the satisfaction of entrepreneurs in terms of financial reward. Therefore our hypothesis of a link between both types of satisfaction was confirmed. From the graph in chart 5, it is clear that a large majority of businessmen is more or less satisfied, both in financial terms and in terms of the physical and psychological aspects. We explored the level of satisfaction from two points of view – financial and physical+psychological. The test turned out that the two were related and affected one another.

Fig. 5 Satisfaction of entrepreneurs (1 = totally, 5 = not at all)



Source: Own primary research

6. Decision trees

In the final processing step, we created classification trees. Decision trees were constructed using the three selected methods (CART, CHAID QUEST). The explanatory variable was chosen such as the willingness to enter into business and explanatory variables were chosen as all answers to descriptive questions. The estimate Risk ranges from 0.292 to 0.371 for all the created trees. This means that the success rate of the classification of objects ranged from 70.8 % to 62.9 %. The quality of models therefore was not very high. But this quality can be considered sufficient. It was possible to read a description of people who are willing to enter into business.

The most willing to do business are:

- Middle-aged people with lower education who come from smaller communities. They would like to do business in services, and trade. They have no experience with aid, and would rather use various grants. Someone who conducts business is in their vicinity.
- Younger men with higher education. They know about the support options, would take advantage of not only financial support but also various forms of consulting service.

The least willing to do business are:

- Older women who come from communities of medium size. They know nothing about aid and do not believe it.
- Women with primary education who do not like the possible risk of business, do not know about aid.
- Older people with secondary education who are employed. They favour the secure earnings in employment. About aid they know only from the media.

7. Evaluation

The survey showed not very good results of the survey in terms of information concerning possible aid. 33 % of respondents so far had not met in person with any form of business support, 51 % of respondents know about it only from the media and only 16 % have personal experience with subsidies. Furthermore, we found that 52 % of entrepreneurs do not use support systems in their business because they do not know about them. It is not a very favourable finding that 50 % of respondents think that business support is insufficient and, conversely, only 10 % of respondents considered it to be fully sufficient. The residue of the respondents had no opinion. The greatest interest was shown for the various forms of subsidies, the least amount of interest is concerns guidance and education. The survey also confirmed another assumption, namely, that respondents perceive as the most serious obstacles in doing business, the risk of failure and lack of funds. This is related to the fact that 68 % of respondents favour employment before business, mainly due to a certain monthly income. Another reason why people prefer to work before running an enterprise, is the smaller degree of stress.

Another problem is that many respondents do not consider entrepreneurship as a way out of unemployment. Their fears of business are probably intensified by the current economic situation and hence the standard of living.

Conclusion

Tackling unemployment by encouraging business is done for example in [3]. The authors see the development of a small business as point of departure of a lack of jobs. Respondents of our survey do not see too much in the business some dealing of their unemployment. We conclude that Czech entrepreneurs have very little interest in the use of subsidies from the state and the EU. One of the main reasons is that most business owners do not know about these supports. It is therefore necessary to increase awareness of the aid and to do more easy to take in the websites of individual institutions, where the possibilities of support written or referenced. Despite the fact that these sites exist and the information is on them, awareness about them is not very widespread. The author of [12] describes similar data as our survey. The author of [5] came to a similarly pessimistic conclusion that the implementation of the aid is not very effective. The authors of [6] reached a similar conclusion as we do, that the administration of EU subsidies is very complex.

Furthermore, we found that existing entrepreneurs are more or less satisfied with their situation. But to enter into business is not a good alternative to solve unemployment for people. The financial aspects are the main reason for this.

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Approaches to Sub-Regionalization of Territory: Empirical Study

Abstract

The article deals with the delimitation of sub-regional territorial units that can be categorized as functional regions. Sub-regions can be considered as small regional units, within which the inhabitants commute for basic services, especially to primary schools, basic health services and post office. Territorial conceptual units are a specific case of sub-regions that are used by the Liberec Region in the evaluation and the support of economically weak areas. These units are based on the administrative districts of registry, building and other offices, and on commuting to work. Delimiting sub-regions can be used for an assessment of regional disparities, since these regions are on the one hand compact enough as compared with the individual communities, but on the other hand they are not too large (as compared with administrative districts of municipalities with extended powers). In delimiting sub-regions, commuting to nodal centers, number of inhabitants and basic services play a major role. For a comprehensive assessment of regional disparities, the article also proposes a hierarchical classification of higher regional level (the micro-regional significance centers, regional importance and major regional centers). To determine these further levels, there was also investigated the occurrence of major employers and institutions of a secondary and a university education. The application and verification of the proposed methodological approach was carried out on the example of the Liberec Region.

Key Words

sub-region, nodal region, territorial conceptual unit, typology, regional disparity

JEL Classification: R11, R12

Introduction

This article aims to introduce the approach to define the sub-levels in the Czech Republic, in relation to the NUTS and LAU typology. The term "sub-region" can be understood as a subset of a region. The sub-regional level is not monitored at the EU level; however, it is particularly important for an identification and solution of regional disparities. Cohesion regions (NUTS 2), regions (NUTS 3), and districts (LAU 1) and administrative districts of municipalities with extended powers (MEP) are too big for monitoring disparities. On the contrary, municipalities (LAU 2) represent a very detailed division, which is also affected by heterogeneous size structure of municipalities in the Czech Republic. For this reason, it appears necessary to take into account a territory larger than one municipality, and at the same time narrower than a district of municipalities with extended powers (MEP), and solve it in its entirety with all the links.

Although this approach is already used in spatial planning, its major drawback is that it copies the administrative division of the state into MEP districts. Subregions may be an appropriate territorial unit for monitoring disparities, since they eliminate the negatives of very small municipalities, especially when the availability of amenities is concerned.

Administrative districts of municipalities with extended powers (MEP) are still large territorial units with considerable internal differences. Therefore, they are sometimes unofficially referred to as small districts [9]. In addition, their administrative delimitation does not always correspond with the real links and with a catchment area. On the contrary, sub-regional division used in this article is based on the investigation of functions of municipalities in the catchment area.

1. Literary overview

In the process of regionalization, it is crucial to determine hierarchy of centers and agglomerations. In principle, there are three basic levels of regionalization: macro-regional, meso-regional and micro-regional. A municipality, under certain conditions, may also figure in all three levels. For example, the capital city of Prague can be understood as a macro-region from the nationwide and the broadest point of view. In terms of commuting to work, however, it may be regarded as a nodal center and a micro-region. From the perspective of broader relations (commuting to specialized services and higher educational institutions) it can be viewed as a meso-region. Therefore, it depends on the used scale where with increasing hierarchical level, there is a change of understanding of individual levels [5].

It seems necessary, then, to define the size order and typical features of individual regional levels. As part of research projects dealing with issues such as regional disparities, there are used spatial definitions such as region, micro-region, sub-region, meso-region or territorial conceptual unit. Because of the inconsistent understanding and relativization of concepts, first, it is necessary to introduce the terminology used in the presented research.

According to Skokan, a **region** can be understood as part of the territory within the same country whose border is based on the criteria of homogeneity (internal structure) and functional criteria (dependencies, such as catchment area). Both criteria are combined, and yet cannot exclude one another [13].

A center of a region then fulfills certain functions in the area of services to other municipalities in its hinterland:

- Departmental functions (commuting to primary schools, to purchase goods of non-daily needs, professional health services, etc.);
- Special functions (production for national and international markets, education for a larger area than its own hinterland, etc.) and
- Transport function (mediation of international transport at a greater distance than only for the service of the given hinterland) [1].

Micro-regions can be characterized as territorial units, within which the most intense regional processes, i.e. mainly commuting to work, primary schools and basic types of services, are relatively included. There are qualitative and quantitative differences among the microregions. That is why Hampl further divided them into microregions of the first and the second degree [5]. Microregion of the first degree is considered a fundamental functional region defined by the direction of the prevailing direction of commuting. Microregion of the second degree then covers a total commuting, including school.

Meso-region is represented by a large area with a small link to daily activities of the inhabitants. Within a meso-region, people usually commute to work of a non-daily character, to higher educational institutions and specialized services. In the Czech Republic, 12 centers meet this condition. These are all regional cities except Jihlava. Prague also acts as a center for the Central Region [5].

Within the **sub-region**, only relations between the place of residence and some basic services are relatively included. Other elementary services are then enclosed within the sub-region only partially (e.g. purchase of industrial goods) [6]. The sub-region is characterized by population movements also outside its borders.

For the definition of the sub-region in this article, there were used criteria from the Rural Development Programme: municipality with basic amenities (school, post office, health center), with a population of 1,000 to 1,300 and its nearest catchment area [11].

Territorial conceptual units are another possible approach used for example by the Liberec Region for the delimitation of economically weak regions and the support of their development. The reason is that for the successful support of the development, it is necessary to help not only the community with the occurrence of negative disparities, but also the so-called catchment centers. These centers, however, do not have to have necessarily a low socio-economic level (according to the evaluated indicators). As shown in the example of Prazak, it is more efficient to allocate investment and concentrate economic activity in those regions that have higher productivity [10]. This fact was also confirmed by a research of Felixova, according to which only a third of the volume of subsidies from the Operational Programme Enterprise and Innovation flowed into the economically weak areas and the rest into economically strong regions [3].

Territorial conceptual units are small sub-regional units with the center and a hinterland of about 1,000 to 1,300 inhabitants [8]. Catchment area centers of territorial conceptual units were delimited on the basis of belonging to administrative districts of registry, building and other offices, post offices and commuting to work according to the census in 2001. Centers of territorial conceptual units fulfill basic departmental functions. Territorial conceptual units were first defined in a state institution called Terplan in the years 1974 – 1979, after the last update in 2005, there were defined 1,424 units [9].

To give the overall picture, we should add the definition of **macro-region**. Within the macro-region, almost all regional processes are included, with the exception of transnational relations and foreign trade.

For regionalization of a territory, various methods are used, for example, a method of generalization of the text, cartographic method (using GIS), a method of analysis of distances and spatial interactions (e.g. Reilly´s model), the method of delimiting nodal (catchment) regions or cluster analysis (see e.g. typology of cities in [2]). These methods were used in the creation of typologies of regions in the presented research.

2. Research methodology

Based on the approaches in the previous chapter, there were set basic indicators for delimiting sub-regions. The procedure for delimiting a sub-region for evaluating social and economic disparities can be divided into the following steps (see also Figure 1):

1. Delimitation of the catchment (nodal) territory – based on the analysis of flows of commuters and residents commuting to/from the municipality, centers of commuting or the so-called nodal centers are specified (data source can be census data, if outdated data from integrated transport systems or local further investigation can be used).
2. Determination of a minimum number of inhabitants of a nodal center – the number was determined according to the Rural Development Programme of the Czech Republic (1,000 inhabitants).
3. Checking the existence of basic amenities in a nodal center (i.e. the occurrence of a primary school, post office, general practitioner). These criteria must be met to delimit a sub-regional unit under the Rural Development Programme of the Czech Republic.
4. Synthesis – to be classified as a sub-regional level both criteria must be met, i.e. delimited catchment centers and basic amenities. Municipalities that meet both criteria form the centers of sub-regions. Municipalities from the surrounding catchment area (the prevailing commuting direction) are subsequently assigned to these centers and create sub-regions.
5. Classification of sub-regions and other hierarchical levels. The condition is that for the higher level, all the criteria for a lower level must always be met. The following criteria have been specified:
   - significant catchment area of inhabitants (center of commuting from surrounding municipalities);
   - conditions of sub-regional unit are met, i.e. number of inhabitants and basic amenities (primary school, post office, general practitioner);
   - significant employers by number of employees (the existence of the business of at least medium size with the number of employees in the interval from 100 to 199 according to the CZSO). For analysis purposes, the center of interval was set, i.e. 150 employees. This figure also corresponds with the mean number of employees of a medium enterprise given by the EC within the business support programs,

where one of the criteria for identifying SME is a number of employees in the range of 50 to 250;
- existence of a secondary school located in the municipality;
- existence of the institution of a university type (interdisciplinary focus with multiple disciplines, with more faculties and more degrees of education) based in the municipality, the additional criterion is the number of inhabitants over 90,000; therefore meeting not only departmental, special and transport functions, but also the function of promoting innovation and competitiveness, decision making, monitoring and mediating function of links with the global world.

Centers of the metropolitan significance can be defined as the highest level centers (in terms of Central Europe). These regions have more than a million inhabitants in total. In the Czech Republic, there are three regional cities with their hinterland, particularly Prague, Brno and Ostrava that meet this condition. These regions also qualify for the NUTS 2 category.

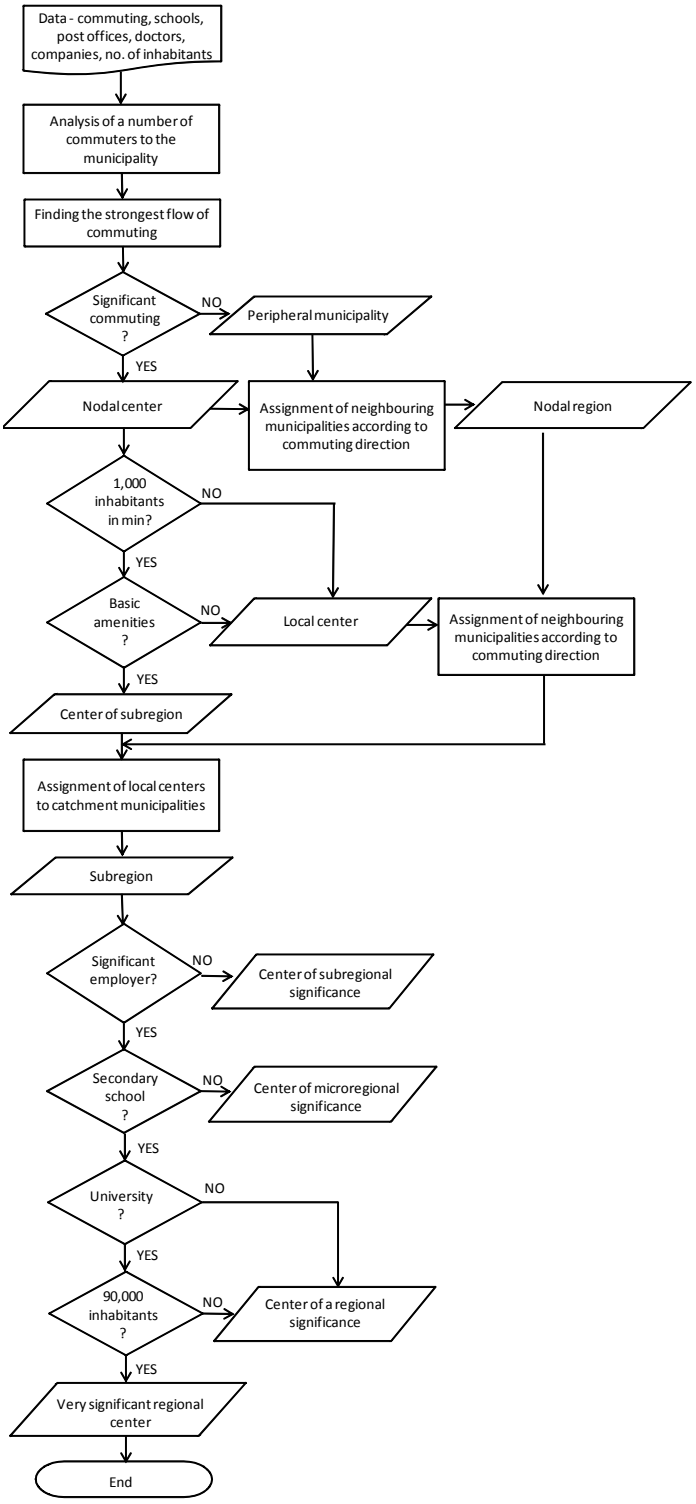
3. Application of the methodology on the example of the Liberec Region

According to the procedure described in the previous chapter, there were first identified nodal regions of the Liberec Region, based on the analysis of data on commuting by public transport. The reason for using the data on traveling by public transport was the fact that the data on commuting from the census of 2011 are not yet available (expected release of these data is May 2013) and the data from the 2001 census are quite outdated. For the analysis of data on commuting from the integrated transport system in the Liberec region (so called IDOL), October 2011, a typical month with no seasonal effects of commuting, was chosen. The included file contains data on travel between individual IDOL zones (number of sold tickets paid by Opuscard or in cash). For the IDOL system, individual zones generally represent municipalities. Only in a few cases, municipalities are divided into a number of zones, or included in one zone with a neighbouring municipality. Based on these data, we might get a fairly accurate indication of the inhabitants travelling by public transport between municipalities in the Liberec Region. The disadvantage is that individual commuting transportation is not covered in our analysis (we can assume greater influence in the peripheral areas of the region). After obtaining the data from Census 2011, the analysis will, therefore, be repeated.

In the next step, meeting the criteria of a sub-regional unit according to the Rural Development Programme of the Czech Republic was evaluated at the centers of nodal regions. This means that the number of inhabitants and the existence of basic services was evaluated (primary education, post office and doctor) in 2011. In the event that the municipality did not meet the condition, the following procedure was chosen. Together with its catchment municipalities, the municipality was incorporated into its closest and the most significant commuting center.

Further, there were also evaluated conditions for the existence of a significant employer, secondary education, higher education of a university type and a population of over 90,000 inhabitants (as of the year 2011) according to Figure 1. This allowed more detailed classification of municipalities and their catchment districts which will be used in the evaluation of interregional disparities.

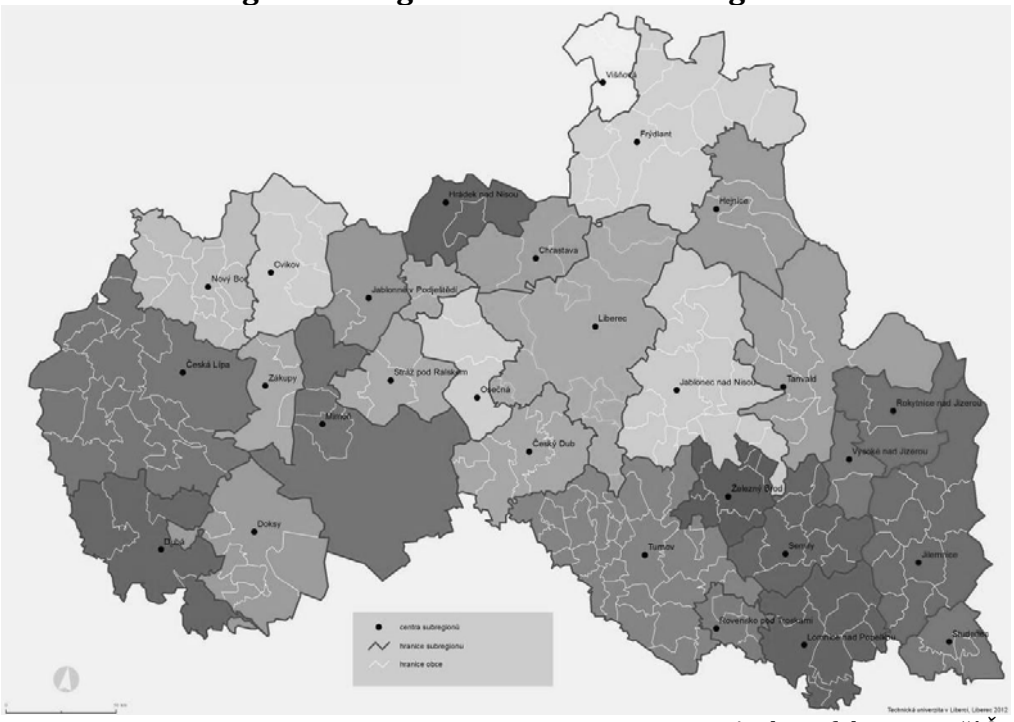
Fig. 1 Process of hierarchization of regional centers



Source: authors´ own design

Based on the above procedure, a typology of municipalities in the Liberec Region was proposed. In the region, there are 215 municipalities, out of which 82 % can be classified as municipalities of a peripheral importance with predominantly residential function. In addition, there were identified 38 municipalities that are important for other municipalities in the Liberec Region in terms of commuting (commuting center, called nodal centers). Out of these, 10 municipalities only fulfill this local function. However, they do not meet other criteria for defining the sub-region, in particular number of inhabitants or basic amenities (basic education, post office, health center). All these conditions are fulfilled by 28 municipalities in the Liberec region. In this way, there were specified 28 sub-regions which are listed in the map (see Figure 2).

Fig. 2 Sub-regions of the Liberec Region



Author of the map: Jiří Šmída, TUL

In the next step, there were investigated functions of municipalities associated with the existence of a significant employer. This function was identified in 21 municipalities which are classified as centers of micro-regional importance.

The condition of a secondary school was met by 13 municipalities, out of which one (a regional city of Liberec) has an institution of higher education and a university-type and also the number of inhabitants over 90 thousand. A total of 12 municipalities can be considered as centers of regional importance, the regional city, then, is regarded as a highly significant regional center.

Individual sub-regions were further compared and contrasted with the administrative districts of the Liberec Region. In the case of several municipalities, it can be said that based on the prevailing commuting for services their functional classification in the sub-region is different – compared with an administrative determination by MEP. These are the following municipalities:

- Drzkov, Pencin, Vlastibor and Zasada have a catchment area in Jablonec nad Nisou according to residents commuting for service, but they belong to administrative district of MEP Zelezny Brod.
- Velky Valtinov, whose catchment area is in Jablonne v Podjestedi (MEP Liberec), belongs to the administrative district of MEP Ceska Lipa. Other municipality within Liberec catchment area is Zdarek which is in the administrative district of MEP Turnov.
- Vesela is in the catchment area of Rovensko pod Troskami (MEP Turnov), but located in the administrative district of MEP Semily.
- Zahori is in the catchment area of Zelezny Brod, but it is in the district of MEP Semily.
- Svojek is in the catchment area of Lomnice nad Popelkou (MEP Semily), but it is in the administrative district of MEP Jilemnice.
- Prysk is in the catchment area of Ceska Kamenice (MEP Decin, the Ustecky Region), but it is in the administrative district of MEP Novy Bor in the Liberec Region.

Conclusion

The aim of the article was to propose a procedure for delimiting sub-regional centers including their catchment communities. The verification of a process was carried out in 2012 on the example of the Liberec Region. Its application to the entire territory of the Czech Republic is planned this year. Sub-regional level may be regarded as a suitable level for quantification and proposals addressing regional disparities, for sectoral analysis, mapping conditions for the establishment of clusters and regional innovation systems (for this topic see [4]). They represent a relatively closed functional unit that is larger than the municipality itself, yet smaller than an administrative district of MEP. The use of sub-regional units largely eliminates the problem of evaluation of very small municipalities, whose basic services are located in a catchment municipality. For the evaluation of sub-regional disparities, the procedure proposed in the methodology [12] can be used. This procedure is based on multivariate analysis of basic statistical indicators supplemented by further local investigation. The sub-regions can be compared with one another throughout the Czech Republic or in individual regions (in relation to the development programme of the region). Delimiting sub-regions may also be an appropriate tool to address disparities at the European Union level, for example when allocating financial resources from structural funds. The classification listed in Figure 1 can be then used to evaluate all hierarchical regional units in the Czech Republic. The intention is to target regional policy instruments at specific conditions and problems of individual territorial units in the Czech Republic.

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