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FRANCHISING IN POLAND AND THE CZECH REPUBLIC – THE COMPARISON OF PACE AND DIRECTIONS OF DEVELOPMENT

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Abstract: The subject of this article is the comparative analysis of the Polish and Czech franchise markets. There were compared, inter alia the origin and adaptation of franchising in both countries and their related duration of the presence of a franchise agreement in business transactions. Comparative criteria included inter alia factors determining the franchising development such as the provisions of law governing the conclusion of franchise agreements and the operation of institutions promoting the franchising idea. Furthermore, the size of both markets was compared by measuring the number of parties to franchise agreements (number of brands and their outlets) and the structure of franchise brands (according to the criterion of the brand origin and its sectors and industries).

Keywords: franchising expansion, franchise market, franchise brands, franchise outlets.

1 Introduction

This year, franchising as a business model celebrates in Europe its 100th anniversary – in Europe franchising occurred for the first time in France in 1911. A franchising precursor is considered to be a Czech footwear manufacturer – Bata [Jacyszyn, 1993, p. 99]. Over the last one hundred years the European economy has been provided with 11.7 thousand franchise brands [Franchise Statistics for 20 countries..., 2010], thanks to which Europe has become¹ “the second² largest franchise continent in the world.” [Franchise Statistics for the Rest..., 2010]. Although the largest European franchise markets are far behind the global franchising leaders like China, Korea, USA and India, but the dynamics of their development is so great that scientific literature and business press draw more and more attention to them.

The aim of this article is to make a comparative analysis of franchise development models in two selected neighbouring countries: Poland and the Czech Republic – countries, in which first franchise brands were launched several dozen years after their first occurrence in Europe. The analysis is made in order to identify common and different elements of both franchise markets, in particular in the field of the pace and directions of their development and their structure.

2 The origin and adaptation of the franchising model in Polish and Czech economies

In Poland, the franchise agreement was applied for the first time after the political breakthrough in 1989, id est almost eighty years after the conclusion of the first franchise agreement in Europe. A franchising pioneer is considered to be a French cosmetics company – Yves Rocher - which commenced developing its distribution network in Poland in 1989. In subsequent four years, franchised outlets were established in Poland by international brands such as the network of Adidas sportswear shops, network of McDonald’s fast food restaurants, network of Jean Louis David hairdressing salons and network of Kodak photo laboratories. Thanks to the success achieved by these brands, Polish entrepreneurs were more and more interested in this new business model. The fundamental reason for their interest was the occurrence of a real and previously unknown in Poland opportunity to run a company as a part of the world famous brand recognised by customers. Consequently, as early as 1990s the first domestic franchise brands were established in Poland – the leaders were the network of A. Bikle confectionery shops and the network of “Pożegnanie z Afryką” coffee shops. In Polish economy, franchising was also applied in the privatisation process of state-owned companies, but

according to K. Bagan-Karluta [Bagan-Karluta, 2001, p. 10], the possibility to transform privatised companies into franchise brands was not fully used in Poland.

Franchising occurred in the post-Communist Czechoslovakia in the early 1990s, id est at the similar time as in Poland, but throughout more than ten years it was recognised as a foreign and innovative form of business activity. Franchising pioneers were foreign brands such as McDonald’s, Yves Rocher and OBI. The popularization and use of franchising were primarily hindered by the Czech entrepreneurs’ insufficient knowledge about its nature and resulted distrust of this new business model. Simultaneously, there were not enough supply and demand for any specialist franchising workshops, literature and consulting services. Factors that affected the slow development of franchising in the Czech Republic were also financial problems, underdevelopment of entrepreneurial culture, flawed laws, legal conscience, lack of know-how about and experience in this form of economic cooperation. Several years later the Czech entrepreneurs began to see profits resulting from this franchise business model. The Czech accession to the European Union also affected the franchising development. Since 2004 the number of parties to franchise agreements has been intensively growing. The favourable factor is on the one hand the growth of the Czech entrepreneurs’ awareness of and knowledge about franchising [Krajca, 2006, p. 21] and on the other hand, better conditions and possibilities to finance franchise ventures – a few banks have already offered products designed for entities operating under franchise agreements (for example, Komerční Banka and Raiffeisenbank) [Jonas, 2010].

To sum up, franchising in the Czech Republic is not so popular as in Poland, but its significance is growing year by year and arouses more and more interest, particularly among small and medium companies.

3 Legal conditions of the franchising development in Poland and the Czech Republic

In Poland the franchise agreement – due to the lack of its parameters in the legal system – is qualified as an innominate agreement. This agreement can be concluded by entities which wish to cooperate each other under the freedom of contract principle, as defined in Art. 353(1) of the Civil Code. According to this principle “any parties concluding the agreement may establish their legal relationship at their own discretion, but the content or aim of such agreement may not violate the nature of this relationship, acts or principles of community life.” Therefore, the franchise agreement is concluded under its parties’ right to freely decide on making or failing to make the agreement, to implement a specific content in the agreement and to freely select its business partner. Franchising theoreticians and practitioners are not unanimous in their view of regulating the franchise agreement in a form of the act. However, in order to keep the balance and safety of entities operating in the franchise system, the indirect solution which makes it necessary to disclose pre-contractual information and to register the agreement, seems to be the optimal solution. The adoption of such regulations would ensure the practical performance of the freedom of contract principle and at the same it would protect the franchisees that join the network.

In the Czech Republic, the issue of regulating the franchise agreement is similar to the Polish one since Czech law does not contain any specific provisions pertaining to franchising. This fact does not impede franchising from developing in the Czech economy, but entrepreneurs which begin to cooperate each other under the franchise agreement must thoroughly analyse the agreements before their signing. Besides the franchise agreement, the source of information for the franchisee is the operational manual provided by the franchisor which includes know-how and specifies regulations concerning its application.

¹ In respect of the number of parties to franchise agreements.

² Asia with 12.6 thousand franchise brands is ranked first.

Furthermore, some aspects of the franchising business model are governed by the European Code of Ethics for Franchising. This Code is not legally binding (neither in Poland, nor in the Czech Republic), but its provisions are reflected in practice, among other things, due to the fact that the compliance with this Code's principles is the condition for membership in the Czech Franchise Association and the Polish Franchise Organization (these two institutions are discussed in details in the subsequent sub-chapter). Unlike in other countries in which the laws do not expressly regulate franchising either, the relevant court decisions are also missing in the Czech Republic. Therefore, the Czech courts did not decide e.g. on that issue that is very important for franchising, being whether Czech law allows the comparison of the position of the franchisee with that of a business representative within the meaning of Section 652 et seq. of the Czech Commercial Code, and whether the franchisee may claim compensation following the termination of the franchising agreement. With the ongoing development of franchising business on the Czech market, the courts can be expected to get more often involved in practical issues in this area. Given the missing express legal regulation, the basic legal standard for franchising is the Commercial Code setting forth the legal relations between businessmen. The Commercial Code governs both the franchising agreement and other issues regarding the relationship between a businessman and a recipient of the franchise, or among the franchisees. Since franchising agreements regularly contain provisions that may distort economic competition, such as the exclusivity clause, ban on competitive conduct, obligation to off-take goods only from the franchisor, ban on active sales beyond a specified territory, also the standards of the antimonopoly law are of significant importance for franchising [Kusak, 2003].

In conclusion, we can state that, despite the absence of regulation of franchising in the Polish and Czech laws, the current legal environment is favourable for this legal form of business.

4 Institutional conditions of the franchising development in Poland and the Czech Republic

Another issue which is as significant as legal conditions and enhances the franchising expansion is the existence of an institution which promotes the franchise business model in a given country. In Poland, this function is played by the Polish Franchise Organization (PFO), which has associated franchising and agency brands operating on the Polish market since 2000. The aim of the PFO is to establish favourable conditions for the franchising development, particularly in legal and financial issues. The organization awards certificates to its members which observe the requirements of the European Code of Ethics for Franchising, conducts workshops for parties to franchise agreements and provides patronage for franchise exhibitions. Moreover, the PFO provides information on the Polish franchise market and is a source of contacts with foreign franchisors which are interested in entering the Polish market. According to the PFO's website, this organization comprises 34 franchisors, which is only 5.2% of all the franchisors of the franchise brands operating in Poland [<http://franchise.org.pl/> (23.11.2011)]. Undoubtedly, the PFO's prestige has risen due to events of the last two years – in June 2010 the PFO became the member of the European Franchise Federation (EFF) and in April 2011 the PFO joined the World Franchise Council (WFC) [<http://franchise.org.pl/pof-admitted-to-the-world-franchise-council> (23.11.2011)].

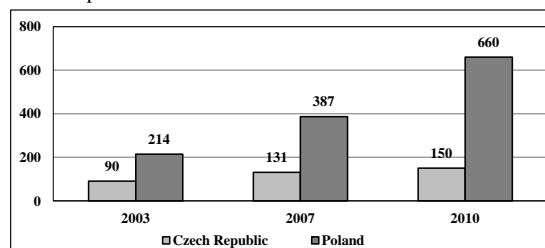
In the Czech Republic the similar role as the PFO is played by the Czech Franchise Association (CFA), which is a non-profit, professional organization associating at the national level franchising providers – franchisors and specialists dealing with franchising issues, lawyers and advisors. CFA was established in 1993 and its mission is to inform non-professional and professional public about the fundamentals and significance of franchising and about successful representatives of this form of business. CFA cooperates with professional and specialised unions in the Czech Republic and other franchise unions in

Europe. CAF has 32 members (just two less than PFO) at present, which is 21.3% of all the franchisors of the franchise brands operating in the Czech Republic. Members of the Czech Franchise Association are first of all big, well-known, international networks. CFA is also a member of EFF and WFC [<http://www.czech-franchise.cz/> (23.11.2011)].

5 The number of franchise brands and outlets in Poland and the Czech Republic

The aforementioned conditions are reflected in the number of franchise brands and its outlets operating on the analysed markets. In 2010, Poland had 660 franchise brands (graph 1) and 38.3 thousand franchised outlets. At the same time, the Czech Republic had 150 franchise brands and 3.5 thousand outlets operating under the franchise agreement. The comparison of the Polish and the Czech franchise markets in absolute figures works to the advantage of Poland because the number of the franchise brands in the Czech Republic equals to only 22.7% of the number of the brands operating in Poland. As for the number of outlets, this disproportion is much greater – the number of sales outlets used by the franchise systems in the Czech Republic equals to 9.1% of the number of the outlets operating on the Polish franchise market.

Graph 1. The number of franchise brands in Poland and the Czech Republic



Source: own source under: *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011; *Cesi se uz franchisingu nebaji – REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).

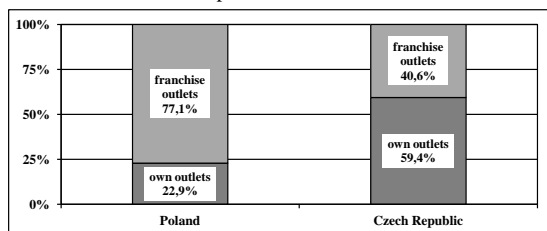
Besides the differences in absolute figures, the analysed franchise markets are characterized by a different pace of development. Over the last seven years the number of the franchise brands in Poland has grown annually by 64 new brands on average (growth by 30% annually). At the same time, the Czech franchise market has grown annually by 9 new brands on average (growth by 10% annually). Therefore, as for Poland the distinctly greater dynamics of the franchise brands growth is observed. However, it is noteworthy that the Czech Republic sees the constant growth of companies operating under the franchise licence in the recent years, which proves that the Czech franchise market is stabilized and the franchising model of the economic cooperation, which has not been appreciated for years, is maturing.

Moreover, the relation of the number of outlets to the number of brands shows the difference in the size of the average franchise brand – in Poland, the average franchise brand comprises 58 franchised outlets and in the Czech Republic, the average brand comprises 23 franchised outlets. These differences primarily result from the different pace of development and the maturity degree of the analysed franchise markets.

Among all the franchise brands operating on the Polish market, the brands having the largest number of franchised outlets are as follows: ABC convenience stores, Orlen petrol stations, Lewiatan convenience stores, Sieć 34 convenience stores and Avans white and brown goods shops [Raport o franczyzie i systemach agencyjnych ..., 2006]. In the Czech Republic the group of the largest franchise brands includes Teta pharmacies, Hruska retail shops, Yamaha music schools, Brnenka retail shops and Fornetti mini-bakeries [Czesi preferuja usługi, <http://franchising.pl/artukul/6061/czesni-preferuja-uslugi/> (05.05.2011)].

By analysing the number of outlets operating as a part of the franchise brands, it is worth drawing attention to their structures. Not all the sales outlets, through which the franchise brands distribute their products or services, have the franchise character in its exact meaning. Since the economic practice shows that some of these outlets are not associated with the franchisors under franchise agreements, but they are owned by them. The outlets owned by franchisors usually play the pilot role or are established in unprofitable fields at the beginning of their operation. The analysis of the structure of the outlets applied by the franchise brands in Poland and the Czech Republic shows the difference between both markets in this regard. In Poland, according to tendencies of the developed franchise markets, a distinct percentage advantage is achieved by outlets associated with the franchisor under the franchise agreement (77%), whereas in the Czech Republic 6 out of 10 outlets are owned by the franchise brands (graph 2). This structure proves the lower maturity degree of the Czech franchise market in comparison with the Polish one.

Graph 2. The structure of outlets used by franchise systems in Poland and the Czech Republic in 2010

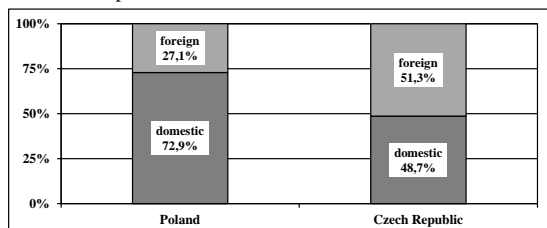


Source: own source under: *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011; *Cesi se uz franchisingu neboji - REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).

6 The franchise market structure in Poland and the Czech Republic

The Czech does not show any special preferences in respect of the origin of the franchise brands. In the late 2010, the Czech Republic had 73 domestic and 77 foreign franchise systems, therefore the percentage difference between these numbers is minimal (graph 3). The different structure in this respect is shown in Poland, where 481 brands are domestic and 179 are foreign. However, it is noteworthy that in recent years Poland has seen the greater quantitative superiority of domestic brands over the foreign ones, which is one of symptoms of the franchise market maturing in this country.

Graph 3. The origin structure of franchise systems in Poland and the Czech Republic in 2010

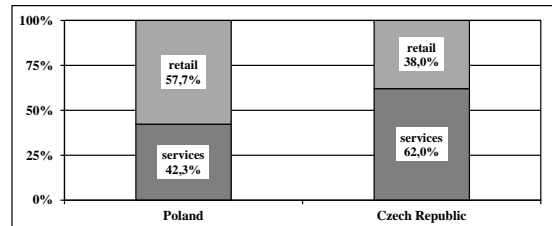


Source: own source under: *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011; *Cesi se uz franchisingu neboji - REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).

Furthermore, the analysed countries differ from each other in respect of a share of the individual industries in the franchise market since the Czech more willingly than the Poles establishes service brands. Last year, such brands equalled to 62% of all the brands (93) – remaining 38% constituted commercial brands (57) (graph 4). The structure of the commercial brand is much easier and faster that establishing the service brand. Despite this fact the Czech prefers services. Poland, in which the franchise market is much more developed, is dominated by shops (57%), and service outlets are less popular (43%). The experts of the Czech franchising consulting company (among other things, M. Halfar, a director with PROFIT system franchise services)

expect that the development of the Czech franchise market will result in the growth of the share of the commercial entities.

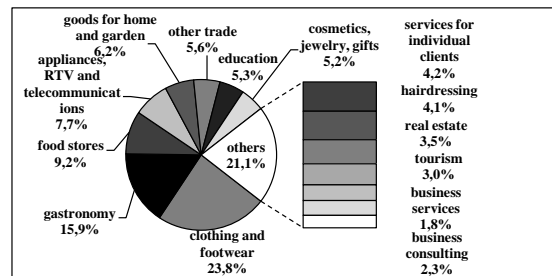
Graph 4. The sector structure of franchise systems in Poland and the Czech Republic in 2010



Source: own source under: *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011; *Cesi se uz franchisingu neboji - REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).

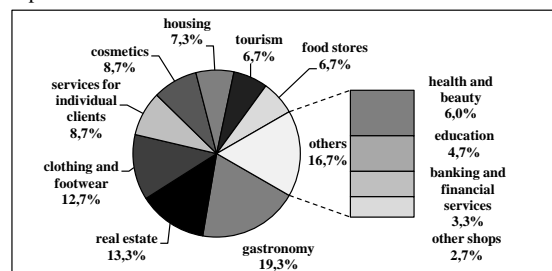
The detailed sector structure of the franchise brands is its industrial approach, which is shown in graphs 5 and 6 for the analysed markets. Thanks to this approach, it can be seen that franchising in both countries is present in at least more than ten industries. The data analysis shown in graphs proves that the franchise brands operating in Poland are dominated by clothing brands, which equal to 24% of all the brands and food catering brands, which equal to 16%. The aforementioned industries have also a considerable share in the Czech franchise brand structure – 19% and 13%, respectively. In Poland the third and fourth places are occupied by commercial brands such as convenience shops and brown and white goods and telecommunication shops with shares of 9% and 8%, respectively. In the Czech Republic, a considerable role (a 13% share) is played by the real estate industry, which in Poland has only a 3.5% share in the franchise brand structure. Another industry which is considerably significant to the franchise market development in the Czech Republic is services rendered to individual customers (9%). This industry in Poland has only 4% of all the franchise brands. This difference is also seen in the tourism industry, which in the Czech Republic is twice as large as in Poland (7% and 3%, respectively).

Graph 5. The industry structure of franchise brands in Poland in 2010



Source: own source under: *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011.

Graph 6. The industry structure of franchise brands in the Czech Republic in 2010



Source: own source under: *Cesi se uz franchisingu neboji - REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).

7 Summary

The conducted analysis shows that the neighbourhood of the analysed countries and the similar moment of conducting the first franchise agreement did not determine too many common features of the analysed franchise markets. The great difference is observed in both the size of the franchise markets measured by the number of brands and outlets and their structure. The differences relate to the brand origin structure, sector structure and the ownership structure of the outlets possessed by the franchise brands. The only similarity is in the industry structure of the franchise brands – in both countries a considerable share is captured by clothing and footwear outlets and food catering outlets.

To sum up, it is noteworthy that the franchise market in the Czech Republic still differs from the Polish one. However, on the basis of the observed pace of changes on the Czech market it can be concluded that this disproportion will slowly diminish. Since the experts amicably predict that the franchise popularity in the Czech Republic will grow. For example in 2011, 70 companies have anticipated to develop their businesses through franchising in the Czech Republic. This would entail that in subsequent years the growth pace of the number of companies operating under the franchise licences in the Czech Republic will be at a similar level. According to the experts' calculations in 2012 over 200 brands will operate in the Czech Republic in comparison with even 900 brands that may operate in Poland [Cesi se uz franchisingu neboji - REPORT, 2011].

In order to evaluate the franchising development in both countries, the ratio of the average number of franchise brands and outlets per one million people can be applied. This ratio is not only applied to compare the countries in relative values, but also it is a parameter applied to evaluate in a simplified way the franchising saturation ratio of the analysed markets. The reference of the number of the franchise systems to the number of people shows a considerable gap in this respect in the Czech Republic – this ratio for Poland equals to 17 brands and 1002 franchised outlets per one million people and for the Czech Republic this ratio equals to 14 brands and 331 outlets per one million people [2011 World Population Data Sheet, 2011].

Literature:

1. BAGAN-KARLUTA, K. *Umowa franchisingu*. Warsaw: C.H. Beck, 2001. 10 p. ISBN 83-7247-041-3.
2. *Cesi se uz franchisingu neboji – REPORT*, <http://franchisinginfo.cz/clanek/727/cesi-se-uz-franchisingu-neboji/> (09.03.2011).
3. Czech Franchise Association Website: <http://www.czech-franchise.cz/> (23.11.2011).
4. *Czesi preferuja usługi*, <http://franchising.pl/artukul/6061/czesi-preferuja-uslugi/> (05.05.2011).
5. *Franchise Statistics for the Rest of the World*, European Franchise Federation, Brussels 2010.
6. *Franchise Statistics for 20 countries in Europe*, European Franchise Federation, Brussels 2010.
7. JACYSZYN, J. *Nowe formy prowadzenia dzialalnosci gospodarczej*. Gdansk: Lex, 2003. 99 p.
8. JONAS, M. *Vyhodnejši financovani fransizy? Ceske banky na to zatim neslysi*, „Denik“ of 23.08.2010.
9. KRAJCA, J. *Franchising – príležitost pro obchodniky*. Prague: Czech Franchise Association, 2006. 21 p.
10. KUSAK, B. *Czech Law and Franchising*. Frankfurt am Main: Norr Stiefenhofer Lutz, 2003.
11. Polish Franchise Organization Website: <http://franchise.org.pl/> (23.11.2011).
12. *Raport o franczyzie i systemach agencyjnych w Polsce 2005/2006*, Warsaw: ProfitSystem, 2006.
13. *Raport o franczyzie w Polsce*, Warsaw: ProfitSystem, 2011.
14. *2011 World Population Data Sheet*, Washington: Population Reference Bureau, 2011. 6 p.

Primary Paper Section: A

Secondary Paper Section: AE, AH

EVALUATION OF CREDITWORTHINESS AND THE THREAT OF BANKRUPTCY OF POLISH ENTERPRISES BASED ON FINANCIAL REPORTING

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Abstract: In times of globalizing business relations, transboundary cooperation of enterprises becomes more and more common practice, and on the other hand, in a great deal of situations it determines a necessity of skillful risk management. It is now present on many levels of economic activity and may refer in particular to optimizing cash flows (both safety of settling liabilities and payment collection). Due to differences in accountancy standards which occur in various countries, it is worth looking closely at the possibility of applying objective ratios used in due diligence analysis, which are particularly oriented to the evaluation of financial creditworthiness of enterprises. Tests performed on a representative sample of Polish enterprises may be a useful resource of testing methods, assisting foreign companies in efficient evaluation of the level of risk during cooperation with companies operating in Poland.

Keywords: risk, bankruptcy, insolvency, predictors, financial analysis, Z-Score, MDA.

1 Methodology of testing - assumptions and a testing sample

This article describes the results of the study of generation of boundary values (which are the most important from the point of view of creditworthiness) of selected ratios which are single-dimension bankruptcy predictors. The author has analysed a total of 310 enterprises which seats of activity are located in Poland. The tested sample included 155 enterprises which in the period 2007-2010 went bankrupt and 155 of companies of good business and financial standing. Analysis of the two populations allowed the author to draw conclusions on shaping of the variability intervals of the most significant ratios of due diligence analysis in enterprises which are near bankruptcy (a year before announcing bankruptcy by the court) as well as in solvent companies. The importance of the research described in the article may be confirmed by the fact that the group of analysed bankrupt companies was a full population of all the entities that went bankrupt in Poland in the period 2007-2010, which were not only obliged to publish their annual financial reports, but which also fulfilled that obligation.

Among 2250 bankruptcies recorded in the 4-year period of the research, a total number of 155 enterprises published their financial reports. Such a low number results from two factors. Firstly, in Polish law [the Accounting Act] entities which fulfilled at least two of the three following conditions in the year preceding the reported year are subject to evaluation and publication of financial statements: (1) average annual employment as converted into full time jobs was at least 50; (2) the sum of assets in the balance sheet at the end of financial year was an equivalent of minimum 2,500,000 EUR in Polish currency; (3) net revenues from sales of products and goods and financial operations for the financial year were an equivalent of minimum 5,000,000 EUR in Polish currency.

Thus, none of the registered enterprises keep integrated accounts in Poland. Some use simplified business record (the so-called revenue and expense ledger). Those companies are, a priori, not obligated to publish their results and their analysis is basically impossible on the basis of publically available information. The second reason of the fact that "only" 155 of 2250 enterprises, which went bankrupt in the studied period in Poland, were analysed, results from the fact that a very high number of entities which are near bankruptcy fail to respect the provisions of law and they not only fail to observe the obligation to publish their annual results in the official journal (Monitor Sądowy B) but also do not submit copies of the results to the files of the National Court Register which are, by definition, made available to third parties. In such cases, due diligence analysis of the entities is impossible.

The research of the 1st group of the entities (bankrupt) aimed at analyzing ratios based on the profit and loss balance 1-3 years

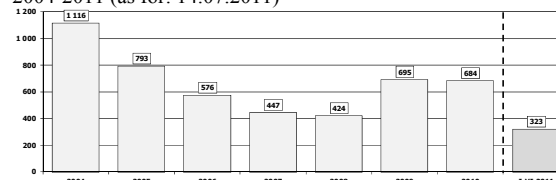
before the bankruptcy was announced. The variability intervals of those ratios are significantly different in companies which go bankrupt than in solvent companies. The companies from the 2nd group (entities which were not endangered by bankruptcy) were grouped based on the following criteria: (1) comparable value of sales revenue (allowing to group entities of similar scale of business in a given field); (2) comparable value of balance sheet total (allowing to group entities of similar value of assets); (3) identical form of business (allowing to group entities which are similar in the requirements of establishment, structure of authority and the liability of entrepreneur).

This article presents the results of the widest performed so far in Poland research project concerning a group of bankrupt enterprises and a properly selected group of "healthy" entities. The results are used in Poland as a reference for analyses performed by certified auditors, financial analysts, as well as managers who analyze on a periodical basis not only their own enterprises but cooperating entities in particular. The article includes only fragments of wider research which main objective is development of multi-dimensional models of early warning about bankruptcy of Polish enterprises (based on discriminant analysis).

2 Macroeconomic analysis of the scale of bankrupt enterprises in Poland

9.25% fewer bankruptcies were announced in total in the 1st half of 2011, until 11.07.2011, as compared to the 1st half of the previous year [Antonowicz P., 2011]. In the 1st half of 2011 we noticed 323 bankruptcies and in the same period of the previous year (January - June 2010) - 357 bankruptcies. The observed increase of bankruptcies in Poland in the period 2009-2010 is stabilizing and the macroeconomic statistics show a noticeable change of the tendency, which had been indicating negative dynamics since 2002.

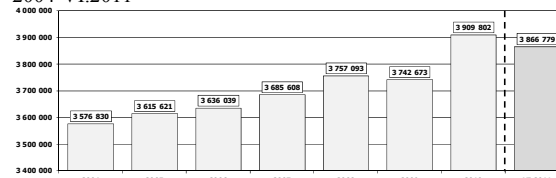
Diagram 1. Number of bankruptcies in Poland in the period 2004-2011 (as for: 14.07.2011)



Source: P. Antonowicz (own research).

More national business entities are registered year by year. As for 31.12.2010, there were a total of 3.9 mln business entities operating in Poland [Local Data Bank of the Central Statistical Office, 01.12.2011]. One can expect that 2011 will end with more than 4 mln of registered business entities.

Diagram 2. National business entities in Poland in the period 2004-VI.2011



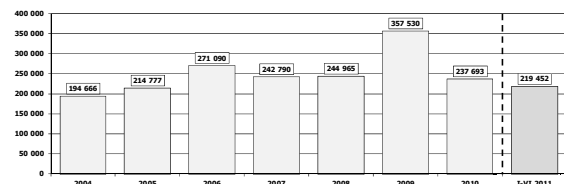
Source: P. Antonowicz (own research, based on Local Data Bank of the Central Statistical Office Bank, 01.12.2011).

On the background of the statistics, the number of bankrupting enterprises may seem a marginal phenomenon. However, while analysing the phenomenon, one should remember that a bankruptcy of a single entity has consequences for a lot of its

cooperating companies, frequently modifying situation on a local labour market, destabilizing business relations between entities in a given sector, or a given region.

The author, according to particular legal acts functioning in Poland (inter alia, Act on Freedom of Business Activity, Bankruptcy and Reorganisation Law), differentiates between liquidation (which is much more frequent in Poland) and bankruptcy of companies.

Diagram 3. Liquidated (deregistered) entities in Poland in the period 2004-2011 (as for: 14.07.2011)



Source: P. Antonowicz (own research, based on Local Data Bank of the Central Statistical Office Bank, 01.12.2011).

17 of each 100,000 business entities in Poland registered in the Central Statistical Office (GUS) were covered by bankruptcy in 2010. However, 6 of 100 entities operating at the same time were undergoing liquidation processes (have been deregistered). The above statistics are, however, very general and do not allow to draw precise conclusions. Some of the liquidated entities were reorganized and seemingly new business entities managed by the same owners occurred in their place. However, the above statistics allow to draw a general conclusions concerning the numbers of bankruptcies and liquidations which occur in the Polish economy.

3 Evaluation of liquidity as the basic measure of enterprise creditworthiness

When evaluating efficiency of operation of an enterprise, most analyses refer to the assessment of liquidity. An enterprise should be capable of maintaining a relevant proportion of liquid assets in relation to incurred liabilities. This guarantees financial stability and the company's ability to repay its liabilities within dates as set by creditors. Thus, in that scope, the study will mainly aim at evaluating the company's surplus of current assets above short-term liabilities. Liquidity is the capacity of an enterprise to timely repay its short-term obligations.

Equation 1

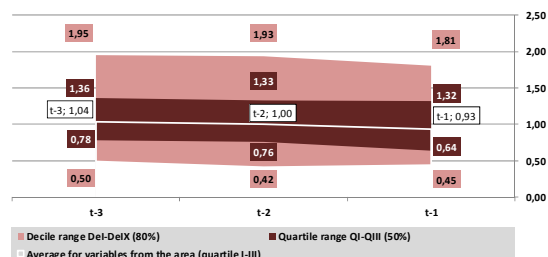
$$\text{Liquidity Ratio} = \text{Current assets} / \text{Short-term liabilities}$$

The above current liquidity ratio shows how much current assets cover current liabilities. The ratio of 1.2 j is frequently assumed as optimum, however, its upper value is 2.0 j. If the ratio is too low, it shows that the enterprise has no assets for repaying current liabilities. If it is too high, it may be a sign of the so-called excessive liquidity which results from failure to utilize cash. Financial safety of an enterprise (or its creditors) should not therefore mean that the company maintains excessive current ratio, since that way the company freezes capital and fails to allocate it in, for instance, short-term investments (possible to be realized in a short time).

3.1 Liquidity in enterprises which go bankrupt and „healthy” entities

The ratio decreases dramatically when approaching the bankruptcy situation. One year before bankruptcy, companies are capable of covering on average 93% of current liabilities with current assets. A typical variability area, occurring in 50% of the “central” enterprises (having removed from the analysis the outliers - below quartile I and above quartile III), is one year before bankruptcy, within the interval 64% - 132%.

Diagram 4. Liquidity Ratio - decile and quartile range, an average for variables from the area (quartile I-III) three years before bankruptcy of polish enterprises



Source: P. Antonowicz (own research based on financial reporting of 155 bankrupt enterprises).

The data presented in diagram 4 should be supplemented with information showing modifications of the ratio in solvent companies (table 1). The ratio in typical „healthy” enterprises (the central 50%) is between 1.2 and 2.61. It means that for each 1,000 PLN of incurred current liabilities the companies maintain on average 1,200 - 2,610 PLN of current assets from which the liabilities will be repaid. Thus, the current liquidity ratio is a measure of payment capacity, which enables verifying payment potential of a cooperating company.

Table 1. Basic statistics - typical variability areas of the analysed Liquidity Ratio characteristic for: 50 / 80% of the population

Basic statistics of Liquidity Ratio	Bankrupt enterprises (N=155)			Healthy enterprises (N=155)
	t ₃	t ₂	t ₁	
N-important observations	135	150	40	155
MIN - minimum	0.10	0.04	0.14	0.43
MAX - maximum	8.40	21.14	4.54	243.04
Average value (for all variables)	1.23	1.30	1.07	4.00
Standard deviation	1.08	1.86	0.76	19.64
Average value (from the area of Q1-Q3)	1.04	1.00	0.93	1.68
- n-important observations (in the area of Q1-Q3)	67	74	20	77
QI - quartile I	0.78	0.76	0.64	1.20
Me - median	1.00	0.98	0.90	1.62
QIII - quartile III	1.36	1.33	1.32	2.61
DeI - decile I	0.50	0.42	0.45	0.84
DeIX - decile IX	1.95	1.93	1.81	4.33

Source: P. Antonowicz (own research based on financial reporting of 310 enterprises).

3.2 Quick liquidity ratio - creditworthiness assessment corrected by the value of stocks

Concurrently, it is worth mentioning that in Polish financial reporting, current assets include not only cash in hand and on bank accounts but also financial assets (shares, stocks, other securities, loans), short-term receivables (from delivery of products and services, taxes, subventions, customs, insurance and other), stocks (products, materials, finished products, semi-products and products under manufacture, advance payments for short-term deliveries). This makes capacity assessment (based on more liquid - equation 2, and the most liquid - equation 3 - components of current assets) is possible based on further modifications of current liquidity ratio.

Equation 2

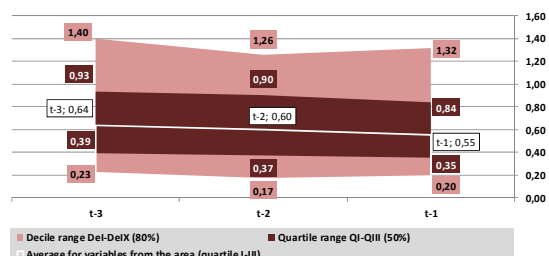
$$\text{Quick Liquidity Ratio} = (\text{Current assets} - \text{Stocks}) / \text{Short-term liabilities}$$

Quick liquidity ratio reflects the potential of repayment of short-term liabilities by an enterprise from such part of current assets which may be capitalized in short time. Therefore, the value of current assets is reduced by the least liquid components - stocks. Due to the correction of the current assets by the value of stocks, the average quick liquidity ratio will be usually lower than current liquidity ratio. In reference books, the correct level of that ratio is its lowest boundary - minimum 1.0 j.

Empirical research conducted by the author prove that, on average, one year before bankruptcy, enterprises maintain 55%

of liquid current assets (less the stocks) in relation to incurred current liabilities (diagram 5). Such a low level of the analysed ratio leads to loss of the payment equilibrium and extension of the days payable outstanding cycle (indicating, de facto, delay in payments and, consequentially, increasing value of overdue liabilities).

Diagram 5. Quick Liquidity Ratio - decile and quartile range, an average for variables from the area (quartile I-III) three years before bankruptcy of Polish enterprises



Source: P. Antonowicz (own research based on financial reporting of 155 bankrupt enterprises).

Table 2. Basic statistics - typical variability areas of the analysed Quick Liquidity Ratio characteristic for: 50 / 80% of the population

Basic statistics of Quick Liquidity Ratio	Bankrupt enterprises (N=155)			Healthy enterprises (N=155)
	t ₃	t ₂	t ₁	
N-important observations	135	150	40	155
MIN - minimum	0.03	0.02	0.02	0.16
MAX - maximum	8.01	15.76	3.22	243.04
Average value (for all variables)	0.82	0.84	0.70	3.23
Standard deviation	0.94	1.42	0.60	19.66
Average value (from the area of Q1-Q3)	0.64	0.60	0.55	1.05
- n-important observations (in the area of Q1-Q3)	67	74	20	77
QI - quartile I	0.39	0.37	0.35	0.64
Me - median	0.64	0.60	0.53	1.04
QIII - quartile III	0.93	0.90	0.84	1.64
Del - decile I	0.23	0.17	0.20	0.33
DelX - decile IX	1.40	1.26	1.32	3.22

Source: P. Antonowicz (own research based on financial reporting of 310 enterprises).

In typical solvent enterprises, the Quick Liquidity Ratio is between 0.64 and 1.64. It means that companies are capable of paying 64% - 164% of the nominal value of short-term payable liabilities from short-time collected receivables and cash. Their capacity is much higher than the ratio of enterprises one year before bankruptcy.

3.3 Immediate liquidity – indicator of actual feasibility of liability repayment

Each company (including also a foreign client) may make use of the subsequent ratio, on the basis of a financial statement of an enterprise using integrated accounts, according to rules adopted in the Polish legal regulations, to carry out an assessment of the actual capacity. The last of indicators discussed in this paper used for evaluating the financial liquidity is the so-called cash liquidity ratio. In literature of the subject it is also called an immediate liquidity ratio, as it defines the value of cash on hand (or on bank accounts) as compared to the value of current liabilities. In other words this ratio tells us to what extent we would be able to regulate our liabilities, if their maturity day fell today.

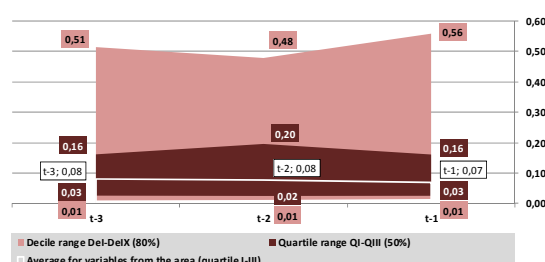
Equation 3

Cash Liquidity Ratio = (Current assets - Stocks - Short-term receivables) / Short-term liabilities

The optimum level of the cash liquidity ratio is not easy to determine, as it depends to a large extent on the specific nature of operation of each enterprise. Cash resources in hand or on bank accounts remaining at the disposal of an enterprise should be basically limited to a minimum. This is due to the fact that there is no need of keeping excessive cash that is not directly involved in economic processes and as an effect brings no

income to the enterprise. Quite often the value of 0.2-0.4 is adopted in Poland as the optimum level of the cash liquidity ratio. This is due to the fact that an excessively high level of the ratio may indicate that cash is not used in the executed business operation. Such information confirms that a financial analysis should be applied very subtly and with a great deal of touch by the person using it. This is a certain kind of art, in which one may not always act in a routine way, in accordance with one and same scheme and template. In many cases a deviation of the given ratio from the standard value is not a result of mistakes in managing an enterprise, but arises from the adoption of a specific and conscious financial policy. This may be an effect of an exceptional situation related to the market situation, but on the other hand it may also be a resultant of the investment stage, in which the given enterprise is at that particular time, or several other factors, the sources of which are both inside the organisation as such and which may also arise from conditions determined by the external environment.

Diagram 6. Cash Liquidity Ratio - decile and quartile range, an average for variables from the area (quartile I-III) three years before bankruptcy of Polish enterprises



Source: P. Antonowicz (own research based on financial reporting of 155 bankrupt enterprises).

As may be seen from a review of diagram 6, the cash liquidity ratio of Polish enterprises a year before bankruptcy amounts to 0.07. This means that Polish enterprises in the process of going bankrupt a year prior to declaration of bankruptcy by the court receive on average PLN 70 in cash per each PLN 1000 of incurred current liabilities. Practice shows that such a state is absolutely insufficient to cover current regulation of liabilities and leads as a consequence to filing of an application for instigation of proceedings related to declaration of bankruptcy by the creditors. Typical companies (the central 50%) endangered by bankruptcy maintain on average 3-16% cash in relation to the liabilities which have to be repaid in a short time.

Table 3. Basic statistics - typical variability areas of the analysed Cash Liquidity Ratio characteristic for: 50 / 80% of the population

Basic statistics of Cash Liquidity Ratio	Bankrupt enterprises (N=155)			Healthy enterprises (N=155)
	t ₃	t ₂	t ₁	
N-important observations	134	149	40	155
MIN - minimum	0.00	0.00	0.00	0.01
MAX - maximum	2.95	2.95	0.92	242.19
Average value (for all variables)	0.21	0.18	0.17	2.34
Standard deviation	0.45	0.34	0.24	19.60
Average value (from the area of Q1-Q3)	0.08	0.08	0.07	0.25
- n-important observations (in the area of Q1-Q3)	66	75	20	77
QI - quartile I	0.03	0.02	0.03	0.07
Me - median	0.07	0.06	0.07	0.22
QIII - quartile III	0.16	0.20	0.16	0.69
Del - decile I	0.01	0.01	0.01	0.03
DelX - decile IX	0.51	0.48	0.56	1.78

Source: P. Antonowicz (own research based on financial reporting of 310 enterprises).

However, typical solvent enterprises maintain this relation at the level ranging from 7 to 69%. They are principally on average able to repay 25% of their liabilities with cash in hand and on their bank accounts (table 3). However, it should be emphasised once again that monitoring the cash liquidity ratio in Polish enterprises (and in others as well) should in each case reflect financial needs of an enterprise over a short period. Consequently, in evaluations of financial liquidity the importance of the latter indicators, without knowledge of the

specific nature of operation of the given enterprise and the adopted financial policy, may prove to be of a smaller importance.

4. Summary

To recapitulate, indicators of the economic and financial analysis presented in this paper allow to evaluate one of the most important aspects from the viewpoint of a risk of loss of capacity – financial liquidity of the Polish enterprises. Apart from analysing: (1) the ability of servicing a debt, (2) assessment of the productivity of assets and sale profitability, (3) as well as the effectiveness and turnover (concerning among others the analyses of the average cycle of payment collection and liability rotation) this analysis remains a very important criterion to diagnose the hitherto effectiveness of the company and to verify the possibility of continuing business operation by the analysed entity. Naturally, the examination of a foreign enterprise (in this case – a company operating in Poland) by subcontractors from other countries would always require an in-depth analysis of several factors (not merely quantitative ones, but also qualitative ones), indicating the stage of its development in the life cycle of such an enterprise and the life cycle of the given sector. Of particular importance in evaluation of the safety of business transactions with such an entity is also the verification of potential tax arrears, as well as the timeliness of making payments of obligatory insurance premiums to Zakład Ubezpieczeń Społecznych (Social Insurance Institution, <http://www.zus.pl/>). Despite the fact that – as has been proven in this paper – the phenomenon of the bankruptcy of enterprises in Poland concerns a marginal per mille value of entities (in 2010 – 0.017% of the total number of registered entrepreneurs), a reliable indicator-based analysis, supplemented by single- or multi-dimensional models for predicting the bankruptcy of enterprises and by their appropriate interpretation may prove to be an invaluable analytic tool that could help minimise the risk of potential issues with debt collection.

Literature:

1. Antonowicz P.: *Procesy upadłościowe przedsiębiorstw w Polsce w pierwszym półroczu 2011 r. - raport z badań*, (eng. *Study report: Bankruptcies of Polish enterprises in the 1st half of 2011*), Wyd. KPF w Polsce, Gdańsk – Warszawa, 2011.
2. (eng. Act on Freedom of Business Activity) Ustawa z dnia 2 lipca 2004 r. o swobodzie działalności gospodarczej [Dz. U. z 2010 r. nr 220, poz. 1447]
3. (eng. Bankruptcy and Reorganisation Law) Ustawa z dnia 28 lutego 2003 r. prawo upadłościowe i naprawcze [Dz. U. z 2003 r. nr 60 poz. 535]
4. (eng. the Accounting Act) Ustawa z dnia 29 września 1994 r. o rachunkowości [Dz. U. z 2009 r. nr 152 poz. 1223]
5. Danych Lokalnych GUS (eng. Local Data Bank of the Central Statistical Office Bank), <http://www.stat.gov.pl/>
6. Zakład Ubezpieczeń Społecznych (Social Insurance Institution), <http://www.zus.pl/>

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THE TASK-ORIENTED AND SUCCESS-ORIENTED NEED OF ACHIEVEMENT AND SELF-IMAGE

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Abstract: The subject of conducted studies is the need for achievement as one of the main motivations of human action. Seeking connections between need of achievement and self-image regression analysis were performed separately for the task-oriented and success-oriented need of achievement. The results indicate that the task-oriented need for achievement is explained mainly by the need for dominance and endurance. With regard to the success-oriented need for achievement in men important explaining variables are: need for autonomy, need for dominance, critical parent and femininity. In women the need for order and deference are explaining the success-oriented need for achievement. Conducted studies shows which traits should be developed to shape a different type of need for achievement for man and women respectively.

Keywords: need for achievement, success/task-orientation, self-image.

1 Need for achievements and self-image

The importance of the need for the achievements has been noticed by writers of different classifications of human psychological needs. There are also authors who have studied only achievement motivation.

Literature is rich in a variety of approach to self-image issues. There are many definitions of self-image, as well as many concepts explaining its structure, dynamics and impact on human functioning. Among the scholars of this topic can be found agreement on the fact that self-image significantly determines human behavior.

1.1 The need for achievement as a psychic power of directing human activity

Within need for achievement can be identified the following elements: obtaining good results in any task, raising standards of excellence (McClelland, 1967, Reykowski, 1985), striving for mastery. Some authors in the understanding of the needs of performance also introduce the aspect of self-esteem (Maslow, 1964, Murray, 1953). Atkinson (1964) takes the view that the strength of achievement motivation depends on the value and the probability of success. Similar understanding of the need for achievement presents Zimbardo (2008). The need for achievement is a perceived need to obtain good results, or at least avoid failure, the general tendency to achieve success, which depends on the strength of belief in success, value of success and perception of personal impact on this achievement.

Murray (1953) placed the need for achievement in the group of needs that are an expression of ambition, strong will, desire for achievement and prestige. McClelland (1953) developed this concept of motives, which he considered as the most important. He believes that the sources of human motivation are three motives: achievement, power and affiliation. McClelland wanted to replace the concept of motivation dominated by the needs with the concept of motivation hedonistic, focused on the expectations. Most research he did on achievement motivation (Koestner, Weinberger, McClelland, 1991, McClelland, 1953).

Achievement motive was defined as the desire to do everything better, crossing the mastery standards. Individual differences in the extent of the needs are perceived as permanent tendencies. He developed a projection tool to measure the need for achievement. For that purpose he used drawings, referring to this need. Then compared stories told by the subjects in the conditions of achievement motivation stimulation with stories told in neutral conditions. Stories differed significantly. When the need for achievement was triggered the respondents revealed more images of achievement, victory, success. This allowed development of a quantitative method of assessment intensity of the need for achievement. McClelland (1967) assumed that the need for achievement measured by projection method examines

the latent motive, different from the explicit needs. However, subsequent studies have shown correlations between the need for achievement estimated by projection techniques and questionnaire-based methods of self-description (Trash, Elliot, 2002).

Some authors take the view that the need for achievement is not a homogeneous construct. You can subdivide this group of needs. Maslow (1964) argued that the need for respect and achievements can be divided into two subgroups. The first group is a desire of power, achievement, mastery and competence, and the second group – a desire to have a good reputation or prestige, status, fame and honor, dominance. A similar distinction for the need of achievement was suggested by the Costello (1967).

Also, an alternative approach to achievement motivation emphasizes these distinctions. They refer to goals that a person has, which undertakes various activities. Usually there are two such major goals. It is therefore considered (Dweck, 1986; Maehr, 1989) that the subject may take one of the following orientations:

- orientation to achieve mastery - person is trying to develop their own competence and skills, so that it will be possible to achieve even higher levels of performance in the future;
- orientation on the level of individual performance-goal is to demonstrate in a specific situation competence higher than other participants.

It was also introduced other distinction of human motivation. Division of human motivation into internal and external was proposed. Intrinsic motivation usually means a tendency to take up and pursue activities because of its very content, interest in the task. Extrinsic motivation is defined as the tendency to take up and pursue activities due to factors external to it, as a consequence of its execution or the effective termination; activity associated with the expected benefits (Lepper, Corpus, Iyengar, 2005, Ryan, Deci, 2000).

In search for better understanding and distinguish between task-oriented and success-oriented achievement motivation it is worth checking if self-image aspects are linked. In addition, knowing of these characteristics may allow discovering what elements of self-image can be developed in order to form a particular type of need for achievement.

1.2 The issue of self-image in the psychological literature

There are many definitions of self-image, as well as many concepts explaining its structure, dynamics and impact on human functioning. Expressions used as synonyms of self-image are: the concept of oneself, knowledge of oneself, the notion of "self", self-knowledge, self-awareness, the concept of "I" (Kostrubiec, 2004).

Self-image results from generalization of the experience of oneself (Walczak, 2000). It is a relatively stable structure, but may change throughout life. Among the factors that cause changes in the self-image may be mentioned the influence of relationships with other people, as well as personal experience (Rogers, 1959). Brzezinska (1973) defines the self-image as a set of knowledge or information about their own characteristics, abilities and skills.

Researchers emphasize that the impact on self-image has a desire to obtain social approval. People compare with others, evaluate themselves and gain feedback from the group (Hurlock, 1985). The concept of "self" is part of organizing and systematizing knowledge of their own - this is a group of opinions and beliefs about their own appearance and physical characteristics, their own skills and abilities, attitudes and needs, their own position among the other people, opinions and beliefs about what the individual should get from the others (Reykowski, 1974).

1.3 The need for achievement and self-image.

The need for achievement understood as a permanent tendency to react in a certain way, and manifested in the actions may be related to the specific shaping of self-image. Success-oriented need for achievement may have a different representation of the self-image, compared to the task-oriented need for achievement. People with high need for achievement, compared to those with low intensity of this need may also show a higher intensity of other mental needs (need for dominance, endurance, order). Also, other elements of the self-image may be shaped differently depending on the orientation of the need for achievement.

The need for achievement is expressed in the long activities, intense, repeated efforts to do something difficult, to work for a distant target, determination to win (Murray, 1953). The person with the need for achievement has a strong willpower. Easily overcomes discouragement and fatigue. Therefore, it seems that people with high need for achievement should be marked by greater endurance.

According to Reykowski (1985) characteristic of need for achievement is to stimulate the need to gain success as an aim itself. In other words, a man directed by this need is not interested only in the achieved things, but in the process of achieving it. In this case a man is interested not in the same subject, which he reaches, but in the fact that for him an object is a measure of success.

A characteristic feature of striving for success is that it is based on the internalized sanctions and rewards for achieving standards of good workmanship. Initially, the impact of other people (eg, father, teacher) is the real prize, and later achievement doesn't have to be rewarded externally, because success itself gain rewarding properties. After reflection of such description it seems that the need for achievement could be related to the scale of critical parent.

On the basis of the theories of need for achievement, as well as after considering the importance of self-image research a question was raised: What dimensions of self-image explain the task-oriented need for achievement and success-oriented need for achievement?

It was expected that the task-oriented need for achievement is more closely linked with the need for endurance and originality-intelligence scales.

It was expected that the success-oriented need for achievement is explained mainly by the need for dominance and scale of the critical parent.

2 Study

2.1 Method

The study was conducted with usage of questionnaire methods.

2.1.1 Subjects

The study was attended by 302 subjects (166 women and 136 men). Average age was 22.9 years (standard deviation 3.5).

2.1.2 Variables

Explained variables are: task-oriented need for achievement and success-oriented need for achievement. It was estimated by using the achievement motivation scale developed by Ray (1975). Cronbach alpha reliability coefficient for the full scale is 0.78 (Ray, 1975). For the study, the method has been translated into Polish.

Explanatory variables consisted of 37 dimensions of the self-image measured by The Adjective Check List – ACL (Gough, Heilbrun, 1983; Juros, Oleś, 1992). The method allows for measuring of various aspects of the self-image and it consists of:

- Modus operandi scales (4 scales);
- Need scales – based on the concept of Murray (15 scales);
- Topical scales – defining the various aspects of interpersonal behavior (9 scales);
- Transactional Analysis scales– created on the basis of the theory of Berne (5 scales);
- Origence-intellectence scales– based on the concept of Welsh, which recognizes creativity (defined as originality), and intelligence as independent dimensions of personality structure (4 scales).

The Adjective Check List consists of 300 adjectives that describe different behaviors and characteristics of men. Person has the task to choose those adjectives that best define her. With these adjectives is obtained a description of 37 dimensions of personality.

2.2 Results

Due to differences in the intensity of the need for achievement in men and women and because of the suppositions about the differences in the explanatory variables for men and women separate regression analyses were performed. Tables 1 and 2 are showing the results of stepwise regression analysis for the task-oriented need of achievement in males and females. Tables 3 and 4 are showing the results for success-oriented need of achievement (for the men and women).

Table 1 Summary of forward stepwise regression for variable task-oriented need for achievement in women

Variables	Error		B	T	p
	Beta	degree of Beta			
(Intercept)	15.73	2.73		5.76	0.000
need for endurance	0.23	0.05	0.35	4.77	0.000
need for domination	0.32	0.07	0.48	4.69	0.000
need for exhibition	-0.14	0.06	-0.23	-2.48	0.014

$R = 0.63, R^2 = 0.40, F_{(3, 162)} = 35.52, p < 0.001$

In women, task-oriented need for achievement is explained by: the need for dominance, endurance and the need for exhibition. The higher need for achievement the higher need for dominance and endurance and a lower need for exhibition. No other self-image variables were found to be significant in explanation of the task-oriented need for achievement in women.

Table 2 Summary of forward stepwise regression for variable task-oriented need for achievement in men

Variables	Error		B	T	p
	Beta	degree of Beta			
(Intercept)	23.66	3.63		6.52	0.000
Need for endurance	0.20	0.05	0.32	3.64	0.000
Need for dominance	0.29	0.08	0.46	3.40	0.001
High origence. low intellectence	-0.11	0.05	-0.18	-2.33	0.021
Self-Confidence	-0.17	0.07	-0.29	-2.27	0.025

$R = 0.58, R^2 = 0.33, F_{(4, 131)} = 22.85, p < 0.001$

In men, the task-oriented need for achievement is explained by the stronger need for dominance and endurance. The higher need for achievement the higher need for dominance and endurance. Moreover, the scale of high origence, low intellectence had a negative relationship with the need for achievement. The higher task-oriented need for achievement the lower self-confidence.

Table 3 Summary of forward stepwise regression for variable success-oriented need for achievement in women

Variables	Beta	Error degree of Beta	B	t	p
(Intercept)	21.11	1.62		12.99	0.000
Need for order	0.12	0.03	0.34	4.52	0.000
Need for deference	-0.10	0.03	-0.28	-3.74	0.000

$R = 0.38, R^2 = 0.15, F_{(2, 163)} = 13.89, p < 0.001$

In women, the success-oriented need for achievement is explained by the need for order and the need for deference. The higher need for achievement the higher the need for order and lower need for deference.

Table 4 Summary of forward stepwise regression for variable success-oriented need for achievement in men

Variables	Beta	Error degree of Beta	B	t	p
(Intercept)	17.74	3.84		4.61	0.000
Need for dominance	0.14	0.04	0.36	3.88	0.000
Critical parent	0.12	0.04	0.28	2.80	0.006
Need for autonomy	-0.18	0.04	-	-4.14	0.000
Feminine scale	0.11	0.04	0.29	2.96	0.004
Need for nurturance	-0.10	0.05	-	-2.05	0.042

$R = 0.49, R^2 = 0.24, F_{(5, 130)} = 8.39, p < 0.001$

In men, success-oriented need for achievement is explained by: the need for autonomy, need for dominance and the need to nurturance. The higher need for achievement the lower the need for autonomy and caring for others and the higher need for domination. Moreover, the success-oriented need for achievement is negatively associated with the scale of the critical parent and positively with the scale of femininity.

2.3 Interpretation of results

The presented results demonstrate that different variables are important in explaining the task-oriented need for achievement and for the success-oriented need for achievement. In addition, different layout of variables was important for women and for men, but there are also present elements in common, particularly in relation to the task-oriented need for achievement.

For women the relationship was observed only for need of achievement with other needs. Task-oriented need for achievement in women is explained in 40% by the needs of: dominance, endurance and exhibition. Success-oriented need for achievement in women is explained in 15% by the need for order and deference.

In men, the relationship was observed for need for achievement with other needs as well as with other features of self-image. Task-oriented need for achievement is explained in men in 33% by the need for dominance and endurance, as well as negatively by the self-confidence and the scale of high originance, low intellectance. Success-oriented need for achievement in males is explained in 24% by the need for autonomy and dominance, femininity scale, the scale of critical parent and the need to take care of others.

The presented studies indicate that for explanation the task-oriented need for achievement need for dominance and endurance are important regardless of gender of subjects. Outcome is consistent with the general understanding of the need for achievement (McClelland, 1953; Murray, 1953;

Reykowski, 1977) and the ability of longer focus on the task by individuals with a greater need for achievement. Higher need for dominance in individuals with higher need for achievement can be explained by a greater tendency to compete by such persons. In addition, in women higher task-oriented need for achievement is associated with a lower need for exhibition. Men with a higher need for achievement are less original, perhaps because they are oriented to complete the task as quickly and as best as possible, while the original solution is associated with an increased risk. That's why it will not be considered. The negative relationship of self-confidence and the need for achievement is inconsistent with the approach of Maslow (1964) and Murray (1953), who claimed that the need for achievement should be joined with high self-esteem and respect for themselves.

With regard to the success-oriented need for achievement, it was explained by a different set of variables. Women with a higher success-oriented need for achievement demonstrate a higher need for order and lower need for deference. It means that a woman of success is one that shows need for order in her activities, but is not subordinated to other. Men with a high need for success are less autonomous, more dominant, but more feminine. This is a fairly complicated picture. To explain it is necessary to immerse oneself into the importance of each variable. Association between need for achievement and need for dominance is clear and similar to that in regard to the task-oriented need for achievement. It's difficult to understand a negative relationship between success-oriented need for achievement and the need for autonomy. Higher need for success also involves an increase in the scale of a critical parent, which may be linked to rewards and punishments internalization (from parents), as an important element of the development of need for achievements (Hagger, Chatzisarantis, 2011).

As the need for achievement is "without substance", i.e. can be developed in various fields of human activity in different ways, it seems important to take into account in further research not only intensity of this need, but also content of this need. It seems that further research should also seek the psychological variables that could be responsible for gender differences which emerged in these studies.

Literature:

1. Atkinson, J. W., Birch, D.: *An introduction to motivation*. New York: Nostrand, 1964. ISBN 0-442-20367-5.
2. Brzezinska, A.: Struktura obrazu własnej osoby i jego wpływ na zachowanie. *Kwartalnik Pedagogiczny*, 3, 87-97, 1973.
3. Costello, C. G.: Two scales to measure achievement motivation. *Journal of Psychology*, 66, 1967.
4. Dweck, C. S.: Motivational processes affecting learning. *American Psychologist*, 41, 1040-1048, 1986.
5. Gough, H. G., Heilbrun, A.B.: *The Adjective Check List Manual* (ed.). Palo Alto, CA: Consulting Psychologists Press, 1983.
6. Hagger, M. S., Chatzisarantis, N. L.D.: Causality orientations moderate the undermining effect of rewards on intrinsic motivation. *Journal of Experimental Social Psychology*, 47 485-489, 2011. doi:10.1016/j.jesp.2010.10.010.
7. Hurlock, E. B.: *Rozwój dziecka*. Warszawa: PWN, 1985.
8. Juros, A., Oleś, P.K.: Struktura czynnikowa i skupieniowa Testu Przymiotnikowego ACL H.G. Gougha i A.B. Heilbruna. In: J. Brzeziński, E. Hornowska (ed.), *Z psychometrycznych problemów diagnostyki psychologicznej*. Poznań: Wyd. Naukowe UAM, 1992.
9. Koestner, R., Weinberger, J., McClelland, D. C.: Task-intrinsic and social-extrinsic sources of arousal for motives assessed in fantasy and self-report. *Journal of Personality*, 59, 57-82, 1991.
10. Kostrubiec, B.: *Obrazy postmodernizmu. Badania empiryczne obrazu siebie i obrazu Boga u zwolenników postmodernizmu*. Lublin: Wydawnictwo KUL, 2004. ISBN 83-7363-161-5.
11. Lepper, M. R., Corpus, J. H., Iyengar, S. S.: Intrinsic and Extrinsic Motivational Orientations in the Classroom: Age Differences and Academic Correlates. *Journal of Educational*

- Psychology*, 97, 2, 184–196, 2005. DOI: 10.1037/0022-0663.97.2.184.
12. Maehr, M. L.: Thoughts about motivation. In: C. Ames, R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 299-315). New York: Academic, 1989.
13. Maslow, A. H.: Teoria hierarchii potrzeb. In: J. Reykowski (ed.), *Problemy osobowości i motywacji w psychologii amerykańskiej* (s. 135-164). Warszawa: PWN, 1964.
14. McClelland, D. C.: *The achieving society*. New York: The Free Press, 1967.
15. McClelland, D. C., Atkinson, J. W., Clark, R. A., Lowell, E. L.: *The achievement motive*. New York: Appleton-Century-Crofts, 1953.
16. Murray, H. A.: *Explorations in personality*. New York: Oxford Univ. Press, 1953.
17. Ray, J.: A behavior inventory to measure achievement motivation. *The Journal of Social Psychology*, 95, 135-136, 1975.
18. Reykowski, J.: *Studia z psychologii emocji, motywacji i osobowości*. Wrocław: Ossolineum, 1985. ISBN 8304020793.
19. Reykowski, J.: Obraz własnej osoby jako mechanizm regulujący postępowanie. *Kwartalnik Pedagogiczny*, 3, 45-57, 1974.
20. Reykowski, J.: *Z zagadnień psychologii motywacji*. Warszawa: WsiP, 1977.
21. Rogers, C.: A Theory of Therapy, Personality and Interpersonal Relationships as Developed in the Client-centered Framework. In: S. Koch (ed.), *Psychology: A Study of a Science. Vol. 3: Formulations of the Person and the Social Context*. New York: McGraw Hill, 1959.
22. Ryan, R. M., Deci, E. L.: Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, 25, 54-67, 2000. DOI: 10.1006/ceps.1999.1020.
23. Trash, T. M., Elliot, A. J.: Implicit and self-attributed achievement motives: Concordance and predictive validity. *Journal of Personality*, 70 (5), 729-755, 2002.
24. Walczak, R.: *Obraz siebie u kobiet długotrwałe bezrobotnych*. Lublin: Towarzystwo Naukowe Katolickiego Uniwersytetu Lubelskiego, 2000.
25. Zimbardo, P.: *Psychologia i życie*. Warszawa: PWN, 2008. ISBN 9788301146320.

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THE MODEL OF SOCIAL MARKETING IN LITHUANIA

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Abstract: This article aims to examine main issues of social marketing considering the implementation of European social well-being model in Lithuania. The main reasons of choosing this topic: the growing role of social marketing among public administration institutions, social organizations and society and the authors desire to investigate the EU welfare state model and its wider implementation in Lithuania by using innovative social marketing tools.

Starting from the background of social marketing, the authors also examines the concept of social marketing, the role of social marketing in its application in public administration, the managing social organizations and communicates with society by the social media. This article examines the importance of segmentation of social groups, the implementation of social projects and the media role in the economy.

Keywords: social marketing model, European social well-being model, state institutions and public organizations, social groups, social change.

Introduction

Social change and innovations plays an important role in the developing markets and the society. The relevance of the article lies in the growing influence of social marketing, public administration problems and the future implementation of the welfare state, as well as the desire to look at government, social groups and the media in the economy. The emerging economy of Lithuania, where it is necessary to encourage the variety in status, scope and size of inter-organization cooperation, synergies between public and private, academic and business sectors, organizational and managerial structures to improve innovation capabilities with the help of social marketing.

However, social marketing is often equated with commercial activities or even social media. The attitude should be changed, as there is a need to adapt traditional methods of social marketing that are now well developed when they are to be applied in non-traditional areas, such influencing legislators, foundation officers. The main problem is, do we need concepts and tools, new kinds of education and training, new research, or new measures of success to permit effective diffusion of social marketing into these new context. Otherwise, it is important to understand particularities of social problems of their business activities in Lithuania and to encourage social innovations to solve them.

This article describes the theoretical background of social marketing and presents the conceptual model of marketing and innovations that brings the social change into the social well-being state. The scientific methods of this publication are based on the comparative analysis of scientific literature, systematic approach and synthesis of different views by providing the authors' individual insights on the subject.

1 The situation analysis

Lithuania, after its independence, it was easy enough to consistently move to any European or similar welfare model. But the country has been creating a free market economy and the welfare creation has been postponed for better times on the grounds that it was necessary to reduce government spending on social needs in order to create open economy for business. When Lithuania joined the European Union, the opportunity to at least partly implement the principles of EU welfare model was created. It became possible to use the EU structural funds to improve the social and economic well-being; and through implementation of the Lisbon Strategy program, and now Strategija2000, to increase the quality of life. However, economic crisis in the last decade, globalization and other economic processes erected complex and sensitive problems in development of the European social model and in its implementation in Lithuania. As the slower economy and

innovation development of the EU member countries were observed, the threat to international competitiveness increased. This entire means that the EU, as well as the European social welfare model, is experiencing transformation. Therefore, the initiation of social changes, i.e. shaping the new public management techniques through social marketing tools, is essential in such areas as EU's competitiveness and global impact and as the development of welfare model. In this context, Lithuania that experiences post-crisis economy stage and confront sharpened social problems will face new threats as well as huge opportunities if it implements social changes in state governance and in the social sphere.

Social marketing and the implementation of social change, usually, are associated with the implementation of state social policy and public institutions. (Brown,2010). However, as the experience of the EU and others countries showed, citizens, business organizations and communities of today's are involved in decisions of social issues and dictate their conditions to the public institutions. Media and social media have to meet the needs and expectations of public, businesses and government. More and more citizens expect effective implementation of social ideas from the public government. In principle, the citizens are willing to welcome improvements in public administration and public services, to accept new technology in dealings with government, especially with local one. (Friedli, 2007) Due to these changes new scope of activities emerges. It should be highlighted that the goal of social marketing is such change of behavior that has positive effect on overall well-being, i.e. meeting both individual and community needs. Therefore, it should be noted that social marketing should be measured according the scale of society needs, i.e. monitoring of public needs and gathering the feedback, that ensures adjustment of the management processes, should be done continuously.

2 The concept of social marketing

Social marketing has achieved wide awareness and adoption as an innovative approach to social influence during the last decades. It has a great potential to drive social change and has a variety wide range of uses. Many of social movement involve crowds and community organization. Social marketing can be applied wherever one has a target audience and a behavior one wants to influence it can be brought to influence media gatekeepers, legislators, community activists, corporate executives, and virtually anyone else who can or should play a role in bringing about improved social welfare.

The first steps of social marketing have been seen since 1950s. The principle marketing tools were used as promotion and distribution. Kotler and Zaltman (1971) explored what marketing; it would mean to apply the technology to social issues, in which case, it would be called "social marketing". Manoff (1985) definition as a social influence technology involving the design, implementation, and control of programs aimed at increasing the acceptability of a social idea or practice in one or more groups of target adopters. Maibach (1993) definition of "social marketing" is concerned with the application of marketing knowledge, concepts, and techniques to enhance social as well as economic ends. Walsh (1993) defined social marketing as "the use of commercial marketing tools to influence behavior change, which would improve the target group or any public health or welfare." Andreasen (1994) defines social marketing as the application of commercial marketing technologies to the analysis, planning, execution and evaluation of programs designed to influence the voluntary behavior of target audiences in order to improve their personal welfare and that of the society.

Smith (2006) has termed social marketing as a value creation, communication and distribution process, which is the target audience wants in return for goal-directed behavior, which is

beneficial to the public without the financial and marketing benefits. Social marketing, in many cases, cannot promise an immediate direct benefit or payoff in exchange for adopting the proposed changes in behavior. That's why requires a systematic, thorough and strategic planning process, which takes into account the target audience's needs and desires, to convey social benefits. (Rüteliönè, 2008).

Social marketing influences the subconscious mind and tends to have an impact on behavior change towards the public benefit. McKenzie-Mohr (2000) found that social marketing is the application of marketing concepts, and techniques to achieve specific behavioral goals related to public opinion and thinking. According to Hastings (2007), social marketing aid awarded in problem-solving strategy, including multiple and intensive efforts to change social behavior in public. According to Stead and Gordon (2007) the correct choice of social marketing is to influence social change. French (2009) pointed out that social marketing, aware of the individual user wishes to recovery must take into account what is best for consumers and society, looking at it in the long run. It seems clear, is an agreement that social marketing to influence behavior, that it uses a systematic process of planning and use of traditional marketing principles and techniques, and that its purpose is to provide a positive contribution to society.

2.1 The role of the social marketing

According to Donovan (2003), social marketing is to influence public or group behavior in the right direction, through social innovation, social welfare direction. Private business marketing is targeted to those groups of people that tend to use the advertised products or services, and social marketing, particularly in public funding is likely to be directed to the target group, which has little interest in the message is transmitted. Therefore, we can conclude that social marketing can be an appropriate tool for the dissemination of ideas of social and welfare model, the implementation of the EU.

The main point of reference in terms of social marketing - influence on voluntary behavior change, which is the object of social marketing interest. Behavior change associated with the individual and the individual groups or society in general, certain standards of behavior and the formation and shapes. Principle: a single individual behavior change, access to public behavior change. (Dann, 2010) This creates an environment for new forms of influence and control. In addition, social marketing must be a two way process. In order to change behavior is indeed freely given: Participants must be able to identify themselves, to report on what is at stake for them, how they want the change to take place and so on. (MacFadyenet al., 2004) On the other hand, social marketing is not possible if there is no way to know how / whether the result achieved. (McGovern, 2005)

It should be noted that a number of authors examine the social marketing of a particular case - i.e., drug addiction, cancer, environmental pollution and so on. In fact, more attention is paid to the same problem and the intended outcome, without a special focus on social marketing measures that could meet the maximum of information to society's expectations and needs. (Hastings, 2003, 2006) In addition, it is appropriate to note that little attention is paid to ideas of social groups, as is usually considered a particular problem or need. The most attention is paid to human rights, public health issues. (Grier 2005).

The conceptual model of role of social marketing in the welfare state is shown in Figure 1.

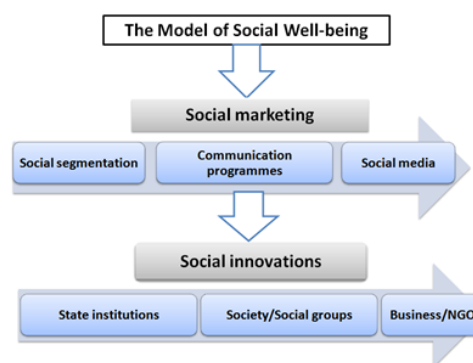


Figure 1. The Model of Social marketing. Source: prepared by authors

2.2 Segmenting the social groups

The developers of social marketing often have to work with such target groups that are ignored by the commercial marketing, i.e. target groups of those that are the least accessible or the most difficult to change behavior. (Donovan, 2010). Thus segmentation and planning are challenging. A required set of measures for social marketing process should not only be able to identify the needs, focus them on target groups, but also to alter the social marketing to effective form of influence. Lefebvre (2001) states that mostly non-profit organizations or public institutions deal with social marketing, however, for solving social problems, business organizations and active members of the public can be included.

Commercial marketers have developed a rich array of bases for segmentation, ranging from relatively straightforward demographic and behavioral measures (e.g., past practices) to sophisticated psychographic and lifestyle profiling. When mixed with information on the vulnerability of target audiences and the costs to reach them, these frameworks can yield sophisticated budget allocation models and insights for creative strategy (Andreasen, 2006).

Also segmentation of social groups can be made according such objective factors, which represents the social status of people in the society: employment, earnings, consumption, savings and property of people. Lefebvre (2008)

2.3 Social marketing communication campaigns and social media effect

Donovan (2010) makes a distinction between efforts to affect individual behavior and public communications campaigns designed to promote the public will for change. Evaluations of campaigns that use social marketing techniques (most individual behavioral change campaigns) provide lessons for evaluating public will campaigns. Too many public information campaigns simply provide information and do not pay enough attention to turning this awareness into action through "public will".

It seldom makes economic or tactical sense to treat a target audience as "mass marketing" approach ignores the considerable variety within most target audiences and underestimates the likelihood that they will clump together strategically meaningful ways. Second, given this variety, a single approach is either so broad as to be ineffective or is it targeted at one dominant group and not meant to meet the interests and needs of a great many other valuable targets. Third, given this variability, it is also likely that some target audience members will be more appealing than others, and some may deserve to be ignored altogether.

Thus, in principle, an optimal strategy is one that aims the most appropriate approach (e.g., a relevant, impactful message and behavioral option) at each target individual or group and that spends no more campaign resources than the segment merits (which might mean zero). The one-strategy-fits-all approach defies market reality, private sector experience, and the need to

optimize small budgets. Thus, modern technology, especially in developed countries, permits "segments of one" through use of the web or direct mail or social media.

Furthermore, given the social marketing process, specificity of the object and purpose, it can be said to be the usual marketing tools are inadequate to ensure the effectiveness of social marketing-oriented consumer, ensuring social exchanges, the planning strategy. In addition, to evaluate the public response to social marketing, to identify both individual and social behavior change, the direct feed-back from public is needed. Thus, you should use the following command and influence the methods and marketing tools that would make it the most social groups, they are under normal conditions, understand forms and the ability to flexibly adapt to changing environmental conditions and to quickly assess public reflection on social marketing by using direct marketing, social media, e-government and etc.

Social problem-solving tools used in e-government, because there are more possibilities to the overall control of the online media manipulation, social exclusion, the information clutter, and formation of political organizations like the society and government agents But, unlike the current information online, allows people to directly interact with the information to which they are introduced. In this way, citizens have the opportunity to interact with each other in real time, regardless of political, geographical borders, to find colleagues, and discuss.

It is appropriate to accept that the electronic society, all e citizens' access to information and freedom to provide information to the same, but now enter information only one who can access to appropriate equipment and interactivity is extremely easy to control. However, access to the Internet does not eliminate the traditional marketing methods: events, media, books, etc. Rather, it allows the cover to act, to communicate with those groups in society, and between those groups that are "new" in the context of traditional influences: Internet, interactive community, and so on. Thus, "it is e democracy actually correspond to the social relations.

In addition, the government can manipulate the public opinion by providing focused information. Although, media serves to help to form the opinion, when in fact it selects and provides us with information so that it is necessary forming opinion. As the fourth power, the media is the only power that no one fails and is not responsible for anything. In the absence of real competition among the media in Lithuania, she ceased to be the information business, in which participants compete on the information novelty, completeness, and objectivity. It was the government that the business is to sell us their opinion on the scandal; it can create its own mapping. The media is not interested in transparency, because that opacity is the main medium of scandal to address. Scandals in which is dominating the insecurity, distrust, anxiety and fear. These feelings help to mitigate the media sold its view of the scandals that provides understanding and forecasting experience. The government acquires the business minds that can be used to further raise the roof. The media is becoming general business and corporate power.

Conclusions

Effective solutions - that are used in the implementation of Lithuanian social policy, in improving public services, in promoting the development of democratic processes and public participation – covers process management, spread of social ideas, accessibility of information and communication technologies. It is related to major changes and new skills. Moreover, in the context of EU enlargement it is often emphasized that international regulation must take such form that more of citizens organizations could participate in the higher stages of political processes, and in such way to avoid marginalia actions and non-traditional forms of influence.

In order that the implementation of social ideas meets requirements of European well-being state, the specific

knowledge that could be used to develop expected results effectively and economically is needed. Thus, the implementation of social ideas should match public social relationship in its multilayered structure, cover communication needs, and use available technology. Peculiarities of the modern society structure and its needs' system require to ensure that citizens have possibility to identify and to shape their own social needs, formulate the problems, find the solutions. In addition, it is essential to obtain rapid feedback, and this validates the impact of social marketing.

Social marketing will enable access to public services for all citizens, ensuring the confidentiality. The government must ensure the data security, provide conditions for communication development, facilitate and make more accessible electronically public procurement and etc.

The purpose of social marketing is to influence social change by developing the chosen social idea. The idea is chosen according the public social needs and carried out in order to create collective benefits and public goods. In any case, the goal of social marketing enables to target social group (often referred to as the social exclusion group) that has specific social needs and, as both commercial and social marketing focus is on needs, evaluates according them social marketing features, tools and techniques.

Often social marketing is facing opposition from business marketing, e.g. business advertise alcohol and tobacco, while the health care system continues to warn about the damage of these products, thus finding their selves in supervisory role. In addition, due to denial factor the target group are either indifferent or even hostile to the proposed behavior change. This urges to find such social marketing's measures that are effective, flexible in both qualitative and quantitative aspects and able to reach as many as possible public groups or subgroups. Since the structure of modern society is very labile and dynamic, therefore influence of measures should be timely and in agreeable manner to each group.

The need of social marketing can be justified by the fact that the law changes behavior by coercion or threat. On the other hand, a change of public behavior through education requires the long-term measures. So, in comparison to the above mentioned methods the social marketing is the most ethical and efficient way to transmit information, because the law by its force nature and education in general may be ineffective.

By resuming it should be stated that the role social marketing is rising everyday by implementing of innovative marketing tools in public administration and public organizations in communication with social groups and businesses in order to achieve the social change and wider implementation the European social well-being model in Lithuania.

Literature:

1. Andreasen, A.R. Social marketing in the 21st century. London: Sage Publications, 2006. 264 p. ISBN 978-1412916349.
2. Andreasen, A.R. Ethics in Social Marketing. Washington, DC: Georgetown University Press, 2001. ISBN 978-0878408207.
3. Brown, T. Wyatt, J. Design thinking for social innovation. Winter. Stanford Social Innovation Review, 2010.
4. Dann, S. Redefining social marketing with contemporary commercial marketing definitions. Vol. 63. Journal of Business Research, 2010.
5. Donovan, R. Henley, N. Social Marketing: Principles and Practice. Melbourne: IP Communications, 2003.
6. Donovan, R. Henley, N. Principles and practice of social marketing: an international perspective. New York: Cambridge University Press, 2010. 504 p. ISBN 978-0521167376.
7. French, J. Social marketing and public health: theory and practice. Oxford: Oxford University, 2009, ISBN 978-0199550692.

8. Friedli, L. *Social Marketing and Mental Health Briefing*. London: Department of Health, 2007.
9. Grier, S. Bryant, C.A. *Social marketing in health promotion*. Vol. 26. *Annual Reviews of Public Health*, 2005.
10. Hastings, G. Saren, M. *The critical contribution of social marketing: theory and application*. Vol. 3. *Marketing Theory*, 2003.
11. Hastings, G. McDermott, L. *Putting social marketing into practice*. Vol. 332 No. 7551. *British Medical Journal*, 2006.
12. Hastings, G. *Social marketing: why should the Devil have all the best tunes?*. Amsterdam: Butterworth-Heinemann, 2007. 367 p. ISBN 978-0750683500.
13. Kotler, P. *Social marketing: influencing behaviors for good*. Los Angeles: Sage Publications, 2008. 444 p. ISBN 978-1412956475.
14. Kotler, P. ZALTMAN, G. *Social marketing: an approach to planned social change*. Vol. 35. *Journal of Marketing*, 1971.
15. Lefebvre, R.C. *Theories and models in social marketing*. 2001.
16. Lefebvre, R.C. *Lessons from social marketing: strategies for the base of the pyramid*. November. *Effective Executive*, 2008.
17. Manoff, R.K. *Social Marketing: A New Imperative for Public Health*. New York, 1985.
18. McKenzie-Mohr, D. Smith, W. *Fostering Sustainable Behavior: An Introduction to Community-based Social Marketing*. Gabriola Island: New Society Publishers, 1999, 160 p. ISBN 978-0865714069.
19. McGovern, E. *Social marketing applications and transportation demand management: an information instrument for the 21st century*. Vol. 8 No. 5. *Journal of Public Transportation*, 2005.
20. MacFadyen, L., Stead, M., Hastings, G. *Social Marketing - A Synopsis* by the Centre for Social Marketing. <http://www.marketing.strath.ac.uk/csm/about/synopsis.htm>. 2004
21. Maibach, E. *Social marketing for the environment: using information campaigns to promote environmental awareness and behavior change*. Vol. 8. *Health Promotion International*, 1993.
22. Rūtelionė, A. *Marketingo sprendimai nekomercinėje veikloje*. Kaunas: Kauno technologijos universiteto leidykla "Technologija", 2008. 164 p. ISBN 978-9955-25-25-243-6.
23. Smith, W.A. *Social marketing: an overview of approach and effects*. *Injury Prevention*. Vol. 12. Suppl. I, 2006.
24. Stead, M., Gordon, R., Angus, K., McDermott, L. *A systematic review of social marketing effectiveness*. *Health Education*. Vol. 107. No. 2, 2007.
25. Walsh, D.C., Rudd, R.E., Moeykens, B.A., Moloney, T.W. *Social marketing for public health*. *Health Affairs*. Vol. 12. No. 2, 1993.

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POSITIVE ECONOMIC INCENTIVES: THE PROMOTION OF THE USE OF ENERGY FROM RENEWABLE SOURCES

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Abstract: This paper is focused on positive economic incentives for environmental protection, particularly on the promotion of the use of energy from renewable sources which should be in accordance with the concept of sustainable development. Firstly, functions and types of economic incentives for environmental protection are described. Next, legislation on the promotion of the use of energy from renewable sources (which follows the Directives of the European Union) is analyzed; approaches to its amendments in the Czech Republic and Germany are compared. Finally, relevant problems are discussed in addition to their possible solutions.

Keywords: economic incentives; environmental protection; renewable energy.

1 Introduction

According to § 32 of Environmental Protection Act No. 17/1992 Coll. as amended, the purpose of economic incentives is either to impose charges of economic exploitation of natural resources or to advantage the use of natural resources in accordance with the concept of sustainable development. Therefore economic incentives are divided into positively and negatively stimulating, depending on whether an environmentally friendly option is favoured, or vice versa.

The use of renewable energy sources is ranked among environmentally friendly use of natural resources for saving non-renewable natural resources as well as for promoting a sustainable development. Currently, the economic incentives supporting the use of energy from renewable sources are discussed not only in the Czech Republic.

A The Member States of the European Union are influenced by the Law of the European Union. The legislation on promotion of the use of energy from renewable sources follows especially Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport, Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity, and Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. There are several problems connected with relevant economic incentives; hence it is a quite controversial issue at present.

2 Economic incentives for environmental protection

2.1 Functions

Generally speaking, economic incentives are indicated as indirectly effecting instruments. However, there are exceptions. Economic incentives should economically stimulate an interest in protecting the environment, and balance shortcomings of administrative system. If compared to administrative instruments (such as licences, permits, statements, and deliverances), economic incentives are more effective.

Economic incentives cannot fulfil their function in centrally controlled economies. Therefore they became an important instrument in meeting environmental objectives after social changes in Europe at the end of last.

The state affects the behaviour of regulated entities through economic incentives which provide a choice whether to behave on behalf of environmental protection. Notwithstanding, it is impossible to opt in some cases (for instance if it is compulsory to use a certain economic instrument).

The behaviour should be environmentally friendly and also economically advantageous (*win-win solution*). However, a state intervention is necessary if environmentally friendly options are much more expensive due to market failure. More commonly, an ecologically inappropriate behaviour is penalized than an ecologically friendly behaviour is favoured.

By virtue of economic incentives, a decision-making should be consistent with the interests of individuals and society. In addition, they should:

- motivate polluters to reduce the environmental burden by harmful substances,
- internalize the external effect of environmentally inferior options,
- serve as resources for the implementation of measures to protect the environment,
- compensate a damage incurred due to harmful activity.¹

2.2 Types

Economic incentives are classified by the Organisation for Economic Co-operation and Development (OECD). Nevertheless, only several types of economic incentives are used in the Czech Republic where their use is either just beginning, or not sufficiently widespread.

The economic incentives of environmental protection include charges for pollution or other environmental burden, fees for the use of natural resources, user fees, taxes, tax benefits or disadvantages, grants, donations and other relief, soft loans and guarantees from the state budget or from the State Environmental Fund, relief in payment or fees, deposit refund systems, instruments to secure obligations or liability (compulsory insurance or securing funds), and tradable emission permits (allowances for greenhouse gas emissions in compliance with the obligations under the Kyoto Protocol provided for in Act No. 695/2004 Coll. as amended).²

It is not possible to cover everything related to finances among economic incentives; it is necessary to distinguish especially a matter of liability (fines, etc.).

3 The promotion of the use of energy from renewable sources

3.1 Background

There is an opinion that the main obstacle to the development of the use of energy from renewable sources is its relatively high cost compared with the cost of energy from non-renewable sources. There are two ways relating to the use of energy from renewable sources: either leaving the market forces in competition with other energy sources, or a government intervention in the energy market (in order to achieve the target of the amount of energy from renewable sources which will be used in a certain period). The current economic policy of the European Union leads to the second method since the prevailing belief is that the market alone is unable to ensure effectively the increasing importance of energy from renewable sources in energy balances of individual countries. The objectives of the activities in the energy sector are the security of supply, competitiveness, and environmental protection. In order to

¹ Damohorský, M. et al.: *Právo životního prostředí*. 2nd issue. Praha: C. H. Beck, 2007. p. 40 - 43

² *Ibidem*. p. 44 - 45

promote energy from renewable sources, different ways are used: system of credits for renewable sources, fiscal harmonization, state support, standardization, specific financial support, research and development programs, regional policy promoting renewable energy sources in rural areas, agricultural policy supporting the production of renewable energy sources, etc. A non-discriminatory access to energy market is supported; fiscal and financial measures are taken as well as specific measures to increase the share of biofuels in the market, encouraging the use of biogas and biomass market development. The promotion of the use of energy from renewable sources at renovating and constructing new buildings is indispensable.³

3.2 Economic incentives for the promotion of the use of energy from renewable sources

It is possible to support the production and consumption of electricity, heat, fuel, etc. within the framework of the promotion of the use of energy from renewable sources.

At the present time, grants from the state budget for the use of renewable energy sources, and tax exemptions are provided. Most significant positive incentives are governed by Act No. 180/2005 Coll. on the promotion of electricity from renewable energy sources (Act on Promotion of the Renewable Sources). This Act has transposed Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market. The Czech Republic was free how to reach the target for the contribution of electricity produced from renewable energy sources to gross electricity consumption by 2010 as the Directive does not state a promotion system which should be adopted.

Act No. 180/2005 Coll. focuses solely on promoting the use of renewable sources to producing electricity, not to renewable sources as a whole (this Act does not support the production of thermal energy from renewable sources). The promotion of the use of electricity is needed to balance the cost of electricity produced from fossil fuels or nuclear power which does not include the economic evaluation of the negative effects of electricity production from non-renewable sources. Two incentives for the production of electricity from renewable sources are governed by this Act: feed-in tariff and green bonus.

When using feed-in tariffs, a producer of electricity from renewable sources offers to purchase its electricity to an operator of distribution or transmission system which has an obligation to redeem all the production of electricity from renewable sources for fixed feed-in tariffs. The tariffs vary depending on the cost of electricity production in different types of equipment. The producer has guarantee sales of electricity and does not have to find customers. However, the operator can use the redeemed electricity from renewable sources only to cover its own consumption and losses. *'The feed-in tariff systems ... have the advantage of investment security, the possibility of fine tuning and the promotion of mid- and long-term technologies. On the other hand, they ... may be challenged under internal market principles, and involve a risk of over-funding'*.⁴ This risk is of fundamental importance in considerations over the concept of positive economic incentives.

An alternative support system of production of electricity from renewable sources is the system of green certificates. The green certificate is a supplement to the market price of electricity, depending on its quality (the lower the quality of electricity, the higher the green bonus). The quality of electricity, i.e. its reliability, predictability and controllability, depends on the climatic conditions and vary at different types of renewable sources. Energy Regulatory Office sets the rate of green certificate. The beneficiary is a producer of electricity from

renewable sources. Green certificate is a premium for the production of an environmentally friendly product in addition to a compensation for risks assumed by the producer of electricity from renewable sources.⁵

3.3 White and brown certificates

Green certificate is one of the schemes to transition to a low-carbon economy; there are other schemes of white and brown certificates. White certificates aim at promoting an efficient end use of energy and thus stimulate more sustainable energy consumption. Similarly to green certificates, white certificates guarantee that the electricity has been efficiently consumed. Both can be integrated into a trading scheme. Brown certificates form part of an emissions trading scheme; they should stimulate primarily industrial consumers to stabilize and reduce their greenhouse gases emissions. These market-based instruments require the design of a specific marketplace for the trading of the certificates. It is connected with the need of creating rules, instruments, and bodies to ensure an operation and transparency of this market.⁶

3.4 Amendments to relevant legislation in the Czech Republic

Although possible negative impacts on the state budget, business entities, social area, and the environment were analyzed before the adoption of Act No. 180/2005 Coll., investments in power plants using renewable sources of energy increased especially in 2009 and 2010. The biggest problem is the support of large solar power plants using the scheme of feed-in tariffs. The legislation does not permit to decrease feed-in tariffs as it would be needed. Therefore the promotion of the use of energy from renewable sources is unbalanced with regard to other types of renewable energy sources.

To avoid an increase in electricity prices for customers, the scale of electricity production from renewable sources was the impetus for a review of the existing system of purchase of electricity from renewable sources.

Act No. 180/2005 Coll. has been amended by Act No. 137/2010 Coll. in order to allow to decrease feed-in tariffs by Energy Regulatory Office (since 2011). Several by-laws (for example Decree on conditions for access to the electricity grid No. 51/2006 Coll.) has been amended primarily for the purpose of phasing the development of solar power plants.

Next, Act No. 330/2010 Coll. and Act No. 402/2010 Coll. have amended Act No. 180/2005 Coll. for the same purpose, an impact of revenues from photovoltaic systems: in the next three years, PV plants larger than 30 kWp set up in 2009 and 2010 will have to pay a tax of 26% on the revenues generated.

Furthermore, Promoted Sources of Energy Bill was drafted by Ministry of Industry and Trade in 2010. The bill, submitted to the Cabinet Office, should promote the use of energy from renewable and secondary sources, and from high-efficiency, combined production of electricity and heating. This bill was drawn up to the implementation of Directive 2009/28/EC in addition to change and scale up current support of renewables governed by Act No. 180/2005 Coll. as amended. The promotion of the use of energy from renewable sources should be long-term, stable, and viable. The promotion of production of electricity from secondary sources is presently governed by Act No. 458/2000 Coll. as amended. Procedures for the promotion should be simplified.⁷ It is noteworthy that according to the bill,

³ Musil, P.: *Hospodářská politika a globální energetický problém : se zaměřením na obnovitelné zdroje*. Praha: C. H. Beck, 2009. p. 26 - 150

⁴ *Energy Law in Europe : National, EU, and International Regulation*. 2nd issue. Edited by Roggenkamp, M. et al. Oxford: Oxford University Press, 2007. p. 1345

⁵ Klotz, M. et al.: *Využívání obnovitelných zdrojů energie. Právní předpisy s komentářem*. Praha: Linde, 2007. p. 46 - 64

⁶ Banet, C.: *The Use of Market-Based Instruments. In Beyond the Carbon Economy : Energy Law in Transition*. Edited by Zillman, D. et al. Oxford: Oxford University Press, 2008. p. 212 - 213

⁷ *Důvodová zpráva k návrhu zákona o podporovaných zdrojích* [cit. 31.12.2010] Available at: <http://www.enepo.cz/attachments/article/92/ZPZ_duvodova_zprava.pdf>

electricity generating plants using solar radiation situated in agriculture or forest land should not be supported like currently.

3.5 Amendments to relevant legislation in Germany

Other European states have to solve the same problem as the Czech Republic does. However, their way to find a solution is not the same. Germany is an example how to decrease the promotion faster.

Several amendments to *Erneuerbare-Energien-Gesetz (EEG)*⁸ have reduced feed-in tariffs in Germany since 2008. Further modifications of support schemes followed in subsequent years; the reductions in feed-in tariffs and additional significant corrections for the next period are planned. What is noteworthy, financial support for installation on agricultural land has been entirely abolished from 1 July 2010 by the amendment of EEG, and conversely, the support has been increased for private users of photovoltaic systems.⁹

In comparison with the Czech Republic, Germany started with changing feed-in tariffs earlier and to a greater extent. Moreover, there is a distinction between solar and other renewable sources in Germany. Czech politicians were not willing to adopt amendments immediately when the problems occurred because of the fear of risking the actions mentioned below, which appeared later as well.

3.6 The issue of retroactivity

Governments of European Union states had similar intentions to reduce the support of solar power plants. Amendments to the renewable energy acts have been adopted, which is considered as a breaking of investors' confidence as well as trust in the renewable technology as a reliable investment. Photovoltaic plants were guaranteed to receive a fixed feed-in tariff for a long-term period so changes of the conditions guaranteed to the operators of solar power plants interfere with the legitimate expectations of their operators. The amendments are assumed to have a retroactive impact. One may therefore expect a number of litigations and arbitrations against European governments.¹⁰

However, there is a prevailing view on this issue that it is not the retroactivity. When considering this legal term, it is necessary to bear in mind that the retroactivity is ruled out particularly in criminal and tort law.¹¹ From a legal point of view there is an important difference between the retroactivity a pseudo-retroactivity which is permissible and quite frequent.¹²

3.7 Ecological tax incentive system

There are several other options how to promote the use of energy from renewable sources. Instruments such as investment aid, tax exemptions or reductions, tax refunds, increase the price at which it can be sold, or increase the volume of such energy purchased, etc. may be applied as a support scheme.

Generally speaking, the ecological tax incentive system is neglected in the Czech legal system despite it is considered to be the most effective economic incentive in terms of influencing the behavior of the business community. Existing taxes should be restructured, new green taxes should be introduced, and external costs should be internalized, etc. in order to comply with the principle of sustainable development. There are several alternatives to the ecological tax reform but the return of funds as a reduction in energy bills is questionable.¹³

⁸ *Erneuerbare-Energien-Gesetz* [cit. 05.01.2011] Available at: < http://www.gesetz-im-internet.de/bundesrecht/eeg_2009/gesamt.pdf>

⁹ *Výkupní ceny v Německu* [cit. 05.01.2011] Available at: <<http://www.czrea.org/cs/evropska-unie-a-oze/vykupni-ceny-nemecko>>

¹⁰ European Photovoltaic Industry Association: *Press Release* [cit. 05.01.2011] Available at: <http://www.czrea.org/files/pdf_en/tz-epia-091210.pdf>

¹¹ Fiala, J. et al.: *Malá právníková encyklopedie*. 7th issue. Praha: Linde, 2008. p. 195

¹² Fiala, J., Kindl, M. et al.: *Občanské právo hmotné*. Plzeň: Aleš Čeněk, 2007. p. 68 - 69

¹³ Petržílek, P.: *Legislativa udržitelného rozvoje a nové podnikatelské příležitosti*. Praha: LexisNexis, 2007. p. 17 - 32

3.8 Protection of the environment

In contrary to the abovementioned view on the obstacle to a development of the use of energy from renewable sources, there are the other ones: high cost of energy from renewable source is not the main obstacle, environmental protection also plays an important role¹⁴, and, I dare say, biases connected with the negative impacts of the use of energy from renewable sources on the environment are indispensable. There is either a very positive approach to this issue or an extremely negative one.

Moreover, a tendency to promote high-technology and large-scale projects such as the incineration of (hazardous) waste rather than the small-scale technology of separation, sorting, material recycling or composting of waste in EU research policy and, at the same time, an interest in seeding agricultural waste recognised as a renewable source of energy, allowing the granting of tax relief or state aid for the generation of biofuels¹⁵, are noteworthy when considering environmental protection related to the use of energy from renewable sources.

4 Conclusions

There are two types of economic incentives: positive and negative. The distinction can be seen in the purpose of their use, which is a motivation to opt environmentally friendly behaviour in the case of positive economic incentives. Although it is possible to use a large range of economical incentives, only some of them are used in the Czech Republic. Furthermore, positive economic incentives should be used more often than the negative ones.

The use of energy from renewable sources is promoted in the European Union for several reasons, *inter alia* for environmental protection. Despite the amount of ways how to promote the use of energy from renewable sources, mainly the systems of feed-in tariff and green certificates are used. This situation has caused an imbalance of the promotion with respect to types of renewable energy sources. In order to restrict support of large solar power plants using the scheme of feed-in tariffs, relevant legal regulations have been amended both in the Czech Republic and Germany where the approach is more intense. However, these amendments have triggered a debate on the issue of retroactivity in addition to an interference with the legitimate expectations. Nevertheless, it was necessary to change schemes of promotion of the use of energy from renewable sources sooner or later to prevent economic, social, and environmental consequences. As it was stated, the purpose of positive economical incentives is to advantage the use of natural resources provided that it is in accordance with the concept of sustainable development. In the opposite case, the positive economic incentives must be restricted.

To conclude, the issue of positive economic incentives to promote the use of energy from renewable sources should be viewed in a broader context, taking into account the internalisation of externalities, energy efficiency, conservation measures, etc. A compromise is essential to select appropriate incentives for a long term (for example taxes) although it appears to be a problematic matter in near future.

Literature:

1. Damohorský, M. et al.: *Právo životního prostředí*. 2nd issue. Praha: C. H. Beck, 2007. 599 p. ISBN 9788071794981.
2. Fiala, J. et al.: *Malá právníková encyklopedie*. 7th issue. Praha: Linde, 2008. 303 p. ISBN 9788072017171.
3. Fiala, J., Kindl, M. et al.: *Občanské právo hmotné*. Plzeň: Aleš Čeněk, 2007. 718 p. ISBN 9788073800581.

¹⁴ *Energy Law in Europe : National, EU, and International Regulation*. 2nd issue. Edited by Roggenkamp, M. et al. Oxford: Oxford University Press, 2007. p. 1347

¹⁵ Krämer, L.: *EC Environmental Law*. 6th issue. London: Sweet & Maxwell, 2007. p. 355

4. Kloz, M. et al.: *Využívání obnovitelných zdrojů energie. Právní předpisy s komentářem*. Praha: Linde, 2007. 511 p. ISBN 9788072016709.
5. Krämer, L.: *EC Environmental Law*. 6th issue. London: Sweet & Maxwell. 2007. 513 p. ISBN 184703067X.
6. Musil, P.: *Hospodářská politika a globální energetický problém : se zaměřením na obnovitelné zdroje*. Praha: C. H. Beck, 2009. 204 p. ISBN 9788074001123.
7. Petržílek, P.: *Legislativa udržitelného rozvoje a nové podnikatelské příležitosti*. Praha: LexisNexis CZ s.r.o., 2007. 230 p. ISBN 9788086920207.
8. *Energy Law in Europe : National, EU, and International Regulation*. 2nd issue. Edited by ROGGENKAMP, M. et al. Oxford: Oxford University Press, 2007. 1488 p. ISBN 9780199217199
9. *Beyond the Carbon Economy : Energy Law in Transition*. Edited by ZILLMAN, D. et al. Oxford: Oxford University Press, 2008. 562 p. ISBN 9780199532698.
10. *Důvodová zpráva k návrhu zákona o podporovaných zdrojích* [Cit. 05.01.2011] Available at: <http://www.enpo.cz/attachments/article/92/ZPZ_duvodova_zprava.pdf>
11. *Erneuerbare-Energien-Gesetz* [cit. 05.01.2011] Available at: <http://www.gesetze-im-internet.de/bundesrecht/eeg_2009/gesamt.pdf>
12. European Photovoltaic Industry Association: *Press Release* [cit. 05.01.2011] Available at: <http://www.czrea.org/files/pdf_en/tz-epia-091210.pdf>
13. *Výkupní ceny v Německu* [cit. 31.12.2010] Available at: <<http://www.czrea.org/cs/evropska-unie-a-oze/vykupni-ceny-nemecko>>

Primary Paper Section: A

Secondary Paper Section: AG

ABOVE THE NEW METHODS OF ACOUSTIC DIAGNOSIS OF VOCAL TONE

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The paper is the result of ongoing research at the Department of Music Culture

Abstract: The modern concept of singing education is based on the book *Resonance in Singing* by Donald Gray Miller. The research is realized using the VoceVista Professional software, which analyzes the individual components of each tone and determines its fundamental frequency and further higher harmonics (H1, H2, etc.) It also shows the presence of other formants contributing to the quality of the tone. The individual components are quantified by their frequency (Hz) and intensity (dB). The result of the tone displayed in this manner is an objective description of the tone and a visualization of tone components that can help both singing teachers (for voice diagnostics) and students when studying singing.

Keywords: fundamental frequency, formant, resonance

Modern singing education, more than any other field of music, opens the question of the nature of the relationship between the macroworld and the microworld of musical performance – i.e. to what extent there is a connection between the quality of a tone and the interpretational concept of what is being sung. In practical education, the described connection is often viewed equally from the educational-psychological (manner of teaching), physiological (voice care) and interpretational-conceptual perspectives, as well as from the perspective of the singing technique. These perspectives may be combined, complement each other or even be incompatible with each other¹.

However, the modern concept of singing education that is coming from the countries of northern Europe, Benelux and from the university in the US Princeton suggests an interdisciplinary cooperation of physio-acousticians, singing teachers and music theoreticians². It is inspiring also for other fields of practical arts of music. Hence conventional singing education may use sufficient feedback from the diagnostics of natural sciences thanks to the developed method of studying resonance in singing on the basis of physio-acoustic connections³. There is a tool but it still waits for wider application.

The basic concept of voice studying is presented in the book *Resonance in Singing* by Donald Gray Miller⁴. The research is realized using the VoceVista Professional software (VVP), which is an actual tool for voice analysis. The method can be briefly characterized by the following points:

1. The sung tone (recorded for the purposes of the analysis or reproduced from a CD or another medium) is, in real time, parcelled out by the VVP software into the fundamental frequency⁵ (F0) and further higher harmonics (H1, H2 etc.)⁶. These are quantified by their frequency (Hz) and their intensity (dB). A detailed composition of the sounding tone is expressed in a so-called power spectrum (VVP, Power Spectrum, see Fig. 1 on the bottom left). As well as any other recording, there is also the standard waveform envelope in the VVP dialogue box (Waveform Envelope, Fig. 1 on the top left).
2. The condition of the glottal activity is mapped by an electroglottograph, which enables to create a model of a specific glottal vibration in a glottal cycle (these data may also be a part of the dialogue box, as in Fig. 1)⁷.
3. The research also maps the acoustic possibilities of sung vowels⁸.
4. For the quality of singing, the existence of the so-called formants and their profiling is important, i.e. the general presence of such physio-acoustic phenomena arising from the cooperation of the glottal signal with articulators⁹. Formants cause resonances in singers. These are independent from the fundamental frequency but are, among other things, affected by the vowels pronounced. A typical trait of human voice is (as opposed to musical instruments) that most of its F0 is relatively weak and the volume of the sound comes from higher harmonics. Strong harmonics, i.e. formants owe their intensity to the resonances of the vocal tract. The first five strongest formants (which are marked according to their frequency from the lowest to the highest F1 – F5) have the biggest impact of singing production. Their frequencies are variable and are conditioned by the position of the lips, the tongue, opening of the jaw and by the position of the other articulators¹⁰. Quoting a significant Czech acoustician, Václav Syrový, we may add: “By changing the form of the vocal tract, it is possible to adjust the position of a formant towards one of the harmonic components of the glottal tone. That is how a conspicuous resonance of the relevant component occurs at the frequency of the formant, resulting in a general amplification and improvement of the voice”¹¹.
5. The research is evaluated in relation to the conclusions of a voice teacher’s professional listenings¹².

Results based on the physio-acoustic analyses of classically trained voices of the opera type fundamentally differ from

¹ As a most charming example of such a paradox, let us mention the recent visit of a group of singing and voice teachers to the Voice Centre in Prague, where, for scientific purposes, each of them underwent an individual examination of their vocal cords by the prominent phoniatrician Dr. Vydrová. The doctor identified the vocal cords of one of our colleagues as soprano – to everybody’s surprise because she was in fact a singer of a lower voice range. The following discussion revealed that the discrepancy between the phoniatric diagnostics and the singing reality is common. However, one important finding follows from this and that is the fact that the influences on the vocal realization of a composition interact with a number of factors and it is not easy to accent one of them at the expense of others.

² For example Czech music theory brings into the voice science something unprecedented in the form of Zich’s concept of the systematics of interpretational means, as well as Janeček’s melodies.

From the perspective of music theory, for instance the following questions are asked:

a) What is the structure of a melody and what is the form of the melody line?
b) In terms of the link to the accompaniment surrounding the melody, we assess whether it is an independent melody or a bound one

c) In terms of style assumptions, we express the features or traits of a style

d) In terms of the link to the text, the connection with text is also important, as well as the musicalization in terms of metrics, as well as the contents

³ The history of research is mapped by SUNDBERG, J. Research on the singing voice in retrospect. *TMH-QPSR*. 2003, 45, 1, p. 11-22. Also available at WWW: <http://www.speech.kth.se/qpsr/>. In the Czech lands, it was Špelda and Burghauer who has participated in the research of history, or Švec at the present time – see the sources.

⁴ MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7.

⁵ i.e. the higher harmonic whose pitch equals the pitch of the sounding tone

⁶ The abbreviations are borrowed from the above-mentioned book. The term “higher harmonic” is a synonym for the older term “aliquot tone”. From what has been said, it may be deduced that H1=F0, that H2 has twice the frequency of F0, etc. The article does not include the new terminology of tones used in the book (e.g. A4 from the book corresponds to our a1). However, when reading the book, the reader is highly recommended to get acquainted with this somewhat confusing system and acquire it quickly.

⁷ Despite the clear influence of the individual specifics of the glottal cycle on the singing performance, we will not deal with this issue here. It is because it introduces the phoniatric dimension into the discussion, which we do not consider in our area of mapping. For further information see MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapters No. 2 (pp. 7-12) and No. 5 (pp.34 – 44)

⁸ See MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapter No. 4 (pp. 21 – 33)

⁹ The moveable parts of the vocal tract (the tongue, the jaw, the velum, etc.) condition the (adjustable) formant frequencies and the air stream affects their dynamics – these parts are all called articulators. All the terms are borrowed from the dictionary of terms of the above-mentioned book – p. 110.

¹⁰ See MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapter No. 3 (pp. 13 – 21).

¹¹ SYROVÝ, Václav. *Hudební akustika*. 2nd supplemented edition. Prague : HAMU, 2008. 448 p. ISBN 978-80-7331-127-8, p. 211

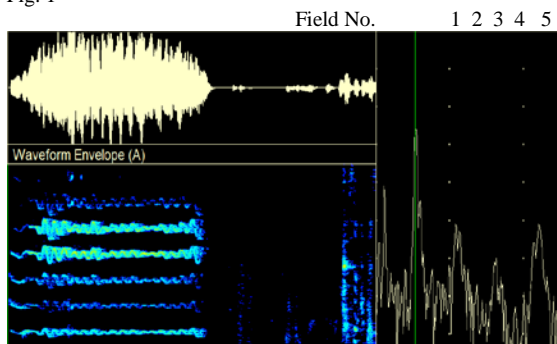
¹² Donald Gray Miller notes on this topic: “Like pedagogical expertise itself, this knowledge is acquired slowly through experience; the objective nature of the signals, however, limits the degree to which a given teacher is free to interpret them.” MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapter 5, Practical Science, p. 35.

untrained voices (see below). Although significant scientists of the field state that all the factors participating in the creation of an opera voice have not been identified, the following comparison shows:

1. the singing formant¹³ appearing in the case of a singing voice, as well as a significant profiling of the formants of lower frequencies. In comparison with their frequency environment, the mentioned formants manifest themselves in their higher intensity (dB).
2. the influence of vibrato in a trained voice that creates variations in the fundamental frequency and its harmonics in such a way that the higher the number of the given harmonic, the higher the variance (e.g. if F0 in a vibrato demonstrates the variance of 15 Hz, for H10 it shows the variance of $10 \times 15 = 150$ Hz, etc.)
3. the impossibility to fully rely on mere abstract mathematical calculations of frequencies and intensities of the individual harmonics. The specific harmonizing of the formants by the singer (either intuitively or by controlled efforts), vibrato and other elementary interactions within the sounding tone cause differences from the calculations and are often conspicuous¹⁴.

To illustrate what has been said, let us perform a short analysis of a tone sung by a specific trained voice – a soprano singing c2 (see Fig. 1). Let us concentrate only on the items of the power spectrum at the right side of the dialog box. These are able to document the conclusions made above.

Fig. 1



The cursor of the power spectrum (Spectrum) shows the fundamental frequency of the sung c2 tone in the syllable [yo]¹⁵. Table 1 demonstrates the arrangement of formants for the individual harmonics. These are determined by the parameters of frequency and intensity. For better orientation, the fields in Fig. 1 in which they are located are also given.

Table 1

Fundamental frequency F0 = H1 (534Hz)	-30dB 1st field
F1 H2 = 1082Hz (as if c3)	-52dB 2nd field
F2 H4 = 2201Hz (as if d^b4)	-53dB 3rd field
F3 H5 = 2705Hz (as if e4)	-56dB 3rd field

¹³ The singing formant is formed by the clustering of at least two formants from the selection of "F3, F4 and F5" that are far less variable than the vowel formants F1 and F2. The singing formant is influential in the frequency area of 2.3 – 3.5 kHz and is a tool that helps the voice to be perceived. In the high tones of some voices, the resonance of the singing formant greatly contributes to the overall level of the acoustic pressure (ibidem p. 120).

¹⁴ Computer data of the mathematical predictions discussed are obtained for example through the so-called linear predictive coding (LPC). However, its results are only plausible for the frequency range of human speech. Ibidem p. 117.

¹⁵ According to the table of the tone frequency of tempered tuning (mentioned for instance in the above-mentioned Hudební akustika by Václav Sýrový, p. 431), c2 corresponds to the frequency of 523.26 Hz. In order for the absolute pitch of the tone to be identifiable by hearing as assigned, it can differ from the table parameter by up to 10 Hz (disproportion lower than a quarter tone). Hence in this case, the norm is met.

F4 H3 = 1612Hz (as if g3-a^b3)	-62dB 2nd field
F5 H6 = 3246Hz (rather a^b4)	-64dB 3rd field

A number of higher harmonics beginning at c2 that are given in the table should correspond to the pitch where H2 = c3, H3 = g3, H4 = c4, H5 = e4, H6 = g4. Note that particularly H3, H4 and H6 show deviations. They are possible because (see above) for instance vibrato may play a role here (e.g. the variation is four times higher for H4 than for F0), or other interactions between harmonics. To determine values closer to the "ideal" positions of harmonics that are defined mathematically, a long-term averaging of singing performance data would have to be carried out¹⁶.

A lot may be deduced from Table 1, for instance that:

- a The strongest frequency of the studied singer's sounding tone is the fundamental frequency. Based on this finding, it may be said that the characteristics of her voice comes predominantly from the glottal source. Note that the distance from the next reinforced harmonic H2 (that is simultaneously the resonance space of F1) has the intensity of 22 dB. That is the largest difference between adjacent harmonics that can be noted in the discussed table. This fact is somewhat in conflict with what is said above. It may be interpreted as that it causes a narrow soprano type, but, in terms of intonation, the clearer. (The fundamental frequency is not a formant but it is a starting impulse for all the physio-acoustic processes happening before the tone leaves the last space in the vocal tract which it goes through and which affects it both in terms of quality and quantity – the oral cavity¹⁷).
- b From the perspective of intensity, the resonance areas of F1 – F5 form a relatively homogenous territory that is placed between 52dB and 64 dB (In Fig.1, it corresponds approximately to the space between the two dots of the vertical intensity scale). However, the range of frequencies belonging among the mentioned intensities is rather large. It involves the tones of the pitch between c3 and as4 but it needs to be realized that it is in fact the space between H2 and H6 that occupies only 5 higher harmonics¹⁸. However, the intensity-bound group of formants F1 – F5 – in average for one formant – is weaker than F0 by almost a half. Therefore the volume of the voice cannot be dramatically increased. (F1 and F2 are also directly formed from the glottal source and are generally the most conspicuous in the resulting sound. They also determine individual vowels¹⁹. Other formants affect predominantly the individual voice timbre. Their parameters are formed by the configuration of the vocal tract.)
- c Despite a certain intensity slump between F0 and further studied higher harmonics²⁰, we may observe some manifestations of the processes that triggered the creation of the so-called singing formant in the analyzed tone. The table clearly shows that the closest distance of frequencies, when observing the area F3 – F5, can be found between H5 and

¹⁶ In the book *Resonance in Singing*, the author discusses a so-called long-term average spectrum (LTAS), which can present useful information about the frequencies and the strength of the singing formant. For further details see MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapter No. 5 (pp.34 – 44)

¹⁷ Thanks to the Madde software (Granqvist, Royal Institute of Technology Stockholm, 2005), it is possible to simulate an acoustic synthesis of voice by creating an electro-acoustically generated voice on the basis of adding or revoking formants to an F0.

¹⁸ It is not possible to use a keyboard to demonstrate the described reality because its system is not composed in compliance with the processes happening within the sounding voice.

¹⁹ See also MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7. Chapters No. 3 (pp. 13 – 21) and No. 5 (pp.34 – 44)

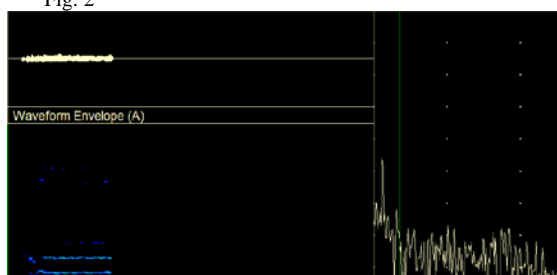
²⁰ The decrease in intensity between F0 and higher harmonics is not caused only by the specifics of the voice, but also by the natural physio-acoustic processes accompanying the journey of the glottal tone through the cavities of the vocal tract. The amplitude of the harmonics of the source spectrum – i.e. the sound spectrum, before it is lead to the resonances of the vocal tract, decreases with the increase of frequency by 6 – 12 dB per octave. This phenomenon is called the frequency slant.

H6 (creating resonances F3 and F5; from the perspective of intensity, it is F3 which is more significant though). And it is here where we can find the typical space for an effective influence of the singing formant on the voice penetration. The absence of the influence of F4 that is, in terms of frequency, not close either to F3 or to F5 may be also the reason for a lower voice volume of the singer, as perceived by a professional aural analysis.

- d The spectrogram in the bottom left part of Fig. 1 documents the development of the tone sung depending on time. The point that is, in parallel, marked by the green cursor in the power spectrum (studied in the analysis) coincides with the left vertical framing of the image. The spectrogram documents that fine segmenting enables us to find further, though inaudible, inner life of the tone. But even it is, in a way, formed by singing training.

For a comparison, an image of a tone sung by an untrained voice, as generated by VVP, is attached (Fig. 2). The difference from the performance of the trained voice is obvious²¹.

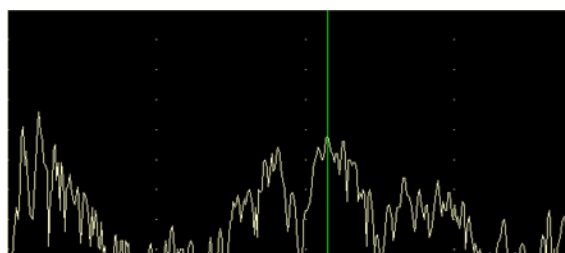
Fig. 2



The absence of formant peaks is evident, as well as the very low intensities of higher harmonics (being often above -70 dB). The measured values belong to a fresh university student, whose voice was recorded and measured during the first lesson of the subject Music Education. If her studies are successful, the better quality of her singing will demonstrate itself not only outwardly, but also in the discussed measuring.

It is always problematic to assess whether an interesting, artistically valuable singing voice has been “created” by the influence of a teacher or whether it has been the natural physiological dispositions of the singer that have played the decisive role in its development. The complexity of this assessment is demonstrated by Fig. 3, which shows the formant structure of a mezzo-soprano voice that has been developing for 15 years “only” on the basis of choir activities under the guidance of an experienced choirmaster. I would like to use the following image as an attractive, scientifically documented argument for parents to convince them that sending their children to a children’s choir is perspective for the healthy development of their children. However, in order to preserve the scientific objectivity of what is stated below, I remain impartial.

Fig. 3



²¹ It is not important for the comparison that the tone analyzed is different here (f1 here). It is the tone structure that matters, i.e. whether it has or does not have the resonance characteristics expressed by the presence or absence of formants. The form of such a structure is individually linked with each singer, as well as “non-singer” and accompanies in basic contours each of his or her singing and “non-singing” performance.

Fig. 3 is also accompanied by a table (see Table 2):

Table 2

Fundamental frequency F0 = H1 (347Hz)	-51dB 1 st field
F1 H6 = 2149Hz (as if c4)	-43dB 3 rd field
F2 H5 = 1821Hz (as if a#3)	-46 dB 2 nd field
F3 H7 = 2660Hz (as if e4)	-56dB 3 rd field
F4 H8 = 2889Hz (as if f#4)	-59 dB 3 rd field
F5 H14 = 4895Hz (as if d#5)	-60dB 5 th field

The cursor of the higher harmonics in Fig. 3 shows the most conspicuous item of the sung tone f1 (the syllable [lah]), i.e. the first formant that occupies the space of H6 (hence higher than F0²² by 2 and half octaves). The full timbre of the voice is also supported by the fact that the first five most influential formants cooperate with the harmonics 5 – 8 (i.e. in the space of a#3 – f#4). Even H14 competes with these (approx. d#5). The mentioned harmonics are significantly distant from F0, hence create a striking voice volume. By summarizing all the mentioned above, we find out that the stated acoustic attributes resemble rather the structuring of the voice trained by an experienced singing teacher, as could be noted in Fig. 1 and Table 1.

Conclusions

The analysis of one tone presents only one perspective on singing performance. However, when evaluating the quality of a voice, such a perspective is an important one. If we agree that a tone is only an “atom” of music though, it is necessary to observe further its mutual horizontal and vertical correlations with other tones. It is important to ask the question of how the physio-acoustic attributes of a vocal tone that are demonstrated through voice quality and its timbre coexist with the interpretational concept, or to put it more generally – with the interpretational thinking of the singer. However, singing education still waits for the question to be answered. magna ipsum, voluptat ut pulvinar sit amet, iaculis in odio.²³

Literature:

1. BEZDĚK, Jiří Teorie interpretace ve vzdělávání sbormistrů. In *Cantus choralis : Mezinárodní sympozium o sborovém zpěvu*. 1. Ústí nad Labem : UJEP, 2010. p. 7. ISBN 978-80-7414-219-2.
2. BEZDĚK, Jiří Vztah nauky o harmonii a teorie interpretace a jeho využití ve výukovém procesu mladých hudebníků. In *Hudobná edukácia : webová konferencia*. 1. Banská Bystrica: Pedagogická fakulta UMB v Banskej Bystrici, SR, 2010. p. 8. Available at WWW: <<http://www.hudobnaedukacia.sk/konferencia.html>>. ISBN 978-80-557-0021-2
3. BEZDĚK, Jiří The Theory of Interpretation in Choirmaster Education, Education and Science without borders. 2010, year I, issue 2, pp. 105–107. ISSN 1804-2473.
4. BEZDĚK, Jiří Nad problémem objektivního uchopení vývoje zpěvního hlasu za pedagogického působení v určitém časovém období. K metodologii výzkumu na Katedře hudební kultury FPE ZČU v Plzni. In *MEDZINÁRODNÝ SEMINÁR spojený s WORKSHOPOM TVORIVÉ VYUČOVANIE SPEVU I*. 1. Žilina: Katedra hudby, Fakulta prírodných vied Žilinskej univerzity, 2011 (published). p. 12.
5. BURGHAEUSER, Jarmil; ŠPELDA, Antonín. *Akustické základy orchestrace*. 1. Prague : Panton, 1967. 213 p. FEIFERLÍKOVÁ, Romana. Prostředky výkonného hudebního umění ve výuce sólového zpěvu na příkladu soudobé vokální skladby. In *sborník z webové konference Hudobná edukácia a vzdelávacie programy*. Banská

²² From the perspective of intensity, F0 is the third.

- Bystrica 2010. ISBN 978-80-557-0021-2, pp.1-10
6. FEIFERLÍKOVÁ, Romana K posuzování pěveckých výkonů na začátku a konci studia Zpěvu na KHK FPE ZCU. : K metodologii výzkumu na Katedře hudební kultury FPE ZČU. In *Hudobná edukácia : webová konferencia*. 1. Žilina: Katedra hudby, Fakulta prírodných vied: Katedra hudby, Fakulta prírodných vied, 2011. p. 12.(published)
 7. HORÁČEK, Jaromír; ŠVEC, Jan. Modelování lidského hlasu : Využití v klinické praxi i při zpěvu. *Vesmír* [online]. 2008, 87, [quot. 2011-11-12]. Available at WWW: <<http://www.vesmir.cz>>. ISSN 1214-4029.
 8. MILLER, Donald Gray. *Resonance in Singing : Voice Building through Acoustic Feedback*. 1. Princeton, USA : Inside View Press, 2008. 131 p. ISBN 978-0-9755307-5-7.
 9. SYROVÝ, Václav. *Hudební akustika*. 2nd supplemented edition. Prague : HAMU, 2008. 448 p. ISBN 978-80-7331-127-8.
 10. SUNDBERG, J. Research on the singing voice in retrospect. *TMH-QPSR*. 2003, 45, 1, pp. 11-22. Available at WWW: <http://www.speech.kth.se/qpsr> Speech, Music and Hearing [online]. 7.9.2004 [quot. 2011-11-12]. Download of free programs written by Svante Granqvist. Available at WWW: <<http://www.speech.kth.se/music/downloads/smptool/>>.
 11. ŠPELDA, Antonín. *Hudební akustika*. 1. Prague : SPN, 1978. 351 p.
 12. ZICH J. *Kapitoly a studie z hudební estetiky*. Prague: Supraphon, 1987. 207 p.

Primary Paper Section: A

Secondary Paper Section: L, M

EUROPEAN FRAMEWORK FOR LITERARY EDUCATION ON LOWER AND UPPER SECONDARY SCHOOL (LIFT-2 PROJECT)

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The paper is published within the frame of European Comenius multilateral project *European Literature Framework for Teachers Secondary Education LIFT-2*.

Abstract: The article reviews one of the European Comenius multilateral project: *Literature Framework for Teachers Secondary Education (LIFT-2)*. The applicant of the project is the Royal University of Groningen, Holland, and has six partners: Holland, Germany, Czech Republic, Romania, Portugal and Finland. The project is managed and guided by prof. Theo Witte (Royal University of Groningen, Holland). One of the aims of the project is to contribute to the meaningful literary education by defining different reading levels from two perspectives: 1. text itself and 2. the reader.

Keywords: literary education, educational content, literary educational conception, reading education, reading levels, child as a reader, secondary school.

1 Introduction: why to establish different reading levels

The contemporary literary education in many European countries is still dominated by literary history and pure knowledge about literature (text, author, history) but the general movement seems to go towards the child / reader as the subject of the education. If we accept the literary education focused on the reader, we have to find the precise aims and categories related to the text as the proper content of literary education. One of the efficient instrument of such oriented literary education that respects child as a reader is to define different levels of the reading. If we, as teachers, are aware of different ways how to read the text, we can introduce our pupils / students to the real textual problems and to the sense of the text more effectively.

2 Introducing the LIFT-2 project

In this article, we would like to introduce one of the European multilateral projects, compiled within the Comenius program - the Literary Referential Framework for Elementary and High School Teachers. Among other things, this project standardizes reading levels for upper level of elementary school and for high schools, and via its web page provides the teachers with the opportunity to participate in polls about the reading levels. The project involves 6 countries (aside from Czech Republic, Finland, Holland, Germany, Portugal and Romania). The project leader is a Dutch reading expert from the Royal University of Groningen, Theo Witte. The project has been in progress since October 2010, and will be finished in June 2012.

2.1 Mapping the European curricular terrain

The first necessary step of the project was to define the existing state of things; that is to examine and describe the situation in the field of education and literary education in each of the countries. It was assessed how the literary education works in the participating countries, if it is possible to find similarities, and how to deal with the differences.

First, each of the countries presented its educational system, described the formal and functional curriculum, and the position of literary education in relation to it (whether it is a separate subject – as in for example Holland, or a subject related to the teaching of the native language – as in Czech Republic). Outputs and aims of the literary education were analyzed based on the reader, text, context/author and individual reading competences (e.g. literal understanding of the text, its interpretation, evaluation etc.) ratio. Theorists from individual countries commented on whether there is an existing canon of literary works within their literary education, and whether the criteria for the text selection or the number of books to be read per year are

defined. In the dissertation thesis of a Dutch post-graduate student Marijne Slager (Royal University of Groningen), the data concerning individual educational systems and programs were contrasted and compared; the similarities and the differences were pointed out and denominated. This analysis served as a basis for the subsequent definition of the reading levels – that is for the creation of the European literary referential framework.

2.2 The methodology of assessing the reading levels in the LIFT-2 project

Assessing the reading levels was one of the central aims of the project, and therefore it took place throughout its entirety, that is between the years 2010 – 2012. The qualitative research was conducted in two phases, national and international, in each in two rounds (one for the upper level of elementary school, and one for high schools), by combining the methods of expert opinion, annotation, and controlled discussion.

In the first phase (national level), each of the project partners (Holland, Germany, Czech Republic, Romania, Portugal and Finland) organized a day-long workshop with the teachers – experts. The teachers-experts were selected from various school types, partly based on the recommendations of the university professors and faculty colleagues (The Centre of Pedagogical Practice of Faculty of Education, Charles University in Prague), and partly on the recommendations made by the principals or the teachers from the selected schools. In organizing the meeting, we aimed for a heterogeneous workgroup, i.e. a group consisting of junior, as well as senior teachers of Czech language and literature, teachers who used different teaching methods, teachers with different minor subjects, and if possible, both male and female teachers.

Before the day-long workshop, concerning the assessment of the readers' level, we asked all the teachers who confirmed their participation, (two workshops took place, one for elementary, one for high schools, as mentioned above), to prepare sixteen books they knew from practice to be read by a significant number of their pupils/students, or which they thought appropriate to be a part of the literary education on the upper-elementary school level, or high school education. The selected titles could be both Czech and foreign; the ratio between the two was not designated. However, the books should equally reflect the demands on the reader, the variability of genre and topic, and the reading interests of both sexes.

We then compared the acquired lists of titles (from one country), analyzed them, and selected sixteen titles, which were to become the basis for the workshop discussion. We provided the teachers-experts with this list; they could now express their personal arguments for the selection of the books into levels. Subsequently, we selected a 'quintessential book' for each level, which was agreed upon by most of the teachers-experts. Each of the experts wrote down a *quick scan* for one of the 'quintessential books'. *Quick scan*, that is a brief, but clearly structured characterization of the examined book (1-2 pages long), containing the basic information about it from both the reading and textual standpoints. This characterization led the teachers to deeper contemplation on the title and consequently to a more careful categorization.

The day-long workshop, conducted mainly in the form of a controlled discussion, was always supervised by one of the partners – project solvers. The workshop took place concurrently in each of the countries, resulting in 12 meetings overall (six countries, two times in each). The meeting was always recorded on a tape recorder, and all the key information

(concerning the reading levels and related arguments) were noted down by two reporters.

The meeting was structured in the following manner: first, the teachers-experts individually compiled characteristics of the reading levels, both from the standpoint of the reader, and of the text (using the structure of the abovementioned *quick scan*). They then debated their notions of various reading levels and explained their perception, looking for accordance. Consequently, they negotiated the inclusion of particular books (from the list of 16 titles) in the individual levels based on their relative difficulty - whether they were too easy or too challenging for a particular reading level. The workshop coordinator also logged the key information in prepared charts, concerned with the four reading levels. The analysis of the acquired information then allowed us to expand the outlines produced during the meeting with further arguments and details.

In the second phase of the project (international level), we confronted the national outputs (consisting of **eight preliminary reading levels**) with each other, and specified the outcome both horizontally (the textual layer) and vertically (reading levels). The result was the **six preliminary reading levels** (see appendix), formulated in such a manner as to achieve transparency and overlapping for lower and upper secondary .

2.3 General description of the reading levels formulated within the LIFT-2 project

The reading levels were determined with regard to the age of the readers, specifically between 12 and 19 years of age, which corresponds to the upper level of elementary school, and high school, in the Czech educational system. In some states of the European Union, however, high school is finished in 18, rather than 19 years of age.

Individual reading levels, labeled by numbers 1 – 6, as well as six key attributes (experiencing reading, engaging reading, exploring reading, interpretative reading, contextualizing reading, pre-academic četba) were always formulated based on two standpoints: 1) student's perspective and 2) the textual perspective.

From the student's perspective we chose the categories of reading experience; *reading experience, interests, general knowledge, literary knowledge*, from the textual perspective we chose immanent textual layers: *style, character, action, chronology, storyline, perspective, meaning*. We believe that these aspects are crucial for a modern, reader-oriented literary education, which sees the text itself as the content of the literary education, and the student as an active subject of the educational process.

2.4 Upcoming web pages

The produced European literary referential framework will be published on the project web pages (in all six languages). In the first phase, each level will be assigned 10 titles (see chart 2), whose inclusion can be influenced by teachers through a poll. It is interesting to note that several books on the list were assigned to two different reading levels (it is a case of a 'reading level transcendence'); this should prompt the teachers to examine the title in relation to both these levels, and help classify the titles that are hard to categorize (those that could not be agreed upon by the teachers-experts). Furthermore, for each level, there are 2 titles from world literature, included in the lists of all six countries (for example for the third reading level of the upper elementary school, it is Orwell's *Animal Farm*, and Tolkien's *The Hobbit*).

Teachers can also propose additional books for various levels, and thus expand the existing lists. In the next phase of the project, each book will be provided with a characterization in the

form of the abovementioned quick scan, which will be further upgraded by didactic and methodological recommendations.

2.5 Methodological support

In the final phase of the project, methodological recommendations for the teachers will be compiled, concerning the questions on how to achieve the aims of a particular reading level (and also which skill is dominantly developed by it), and which methods and activities should be included in literary education, in order for the students to gradually achieve a higher reading level.

3 Representative books for different reading levels

Lower secondary

Level 1 (Experiencing) C. S. Lewis: *The Lion, the Witch and the Wardrobe*

Level 2 (Engaging) P. Pullman: *The Golden Compass* (Northern Lights)

Level 3 (Exploring) J. Gaarder: *The Orange Girl*

Level 4 (Interpretative reading) W. Saroyan: *Tracy's Tiger*

Upper secondary 15-18

Level 1 (Experiencing) S. Meyer: *Twilight*

Level 2 (Engaging) P. Šabach: *Shit burns* (Hovno hoří)

Level 3 (Exploring) I. Dousková: *Proud Budžes* (Hrdý Budžes)

Level 4 (Interpretative reading) E. M. Remarque: *Three comrades*

Level 5 (Contextualizing reading): G. Orwell: *1984*

Level 6 (Pre-academic reading): F. Kafka: *Trial*

4 Example of one of the reader's levels formulated within the project LIFT-2

Level 6 (Pre-academic reading) upper secondary 15-18 Representative book:		
STUDENTS	Reading experience	Have broad representations of literary texts from different epochs, styles and cultures.
	Interests	Have extensive interests; also in aesthetics, style and the authors' poetica.
	General knowledge	Have versatile historical and cultural knowledge they can use for contextualizing what they read.
	Literary knowledge	Can use different perspectives in approaching literature.
BOOKS	Style	Experimental, poetical and metapoetical uses of language.
	Character	The book may require to recognize references to classical archetypes.
	Action	Action is no longer the main focus of the text or it has a symbolical/implicit/more general meaning.
	Chronology	Subjective and relative chronology. Different timelines and shifts in time.
	Storyline(s)	Meta-narrative sequences exposed to the reader.
	Perspective	Changing of different perspectives is not transparent.

	Meaning	There are intertextual, meta-narrative, concrete and abstract motifs and even subtle leitmotifs to be found.
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5 Conclusion

In the conclusion we would like to sum up the benefits and limitations of the European literary referential framework, which emerged from individual phases of the project.

The European literary framework can serve teachers as a means of monitoring the reading development of their students, for the reflection of the reading by the students, for formative, or even summative evaluation, for the students' self-evaluation, and to motivate students towards reading. The European literary framework helps to fortify the position of reading as a part of the curriculum, a center of the literary education. We also find beneficial the involvement of teachers in the creation of this tool (book suggestions, their evaluation), and the possibility of sharing experience with other teachers.

The problematic areas were the following: deciding on a way in which to select the titles (whether the criteria should be based on the interests of the readers or the curriculum), the classification of the titles into the individual reading levels, characterizing the levels themselves (not only from the international, but also national standpoint), and ensuring the inclusion of individual reading skills (with progressive difficulty) on each reading level. We also find limiting the fact that the students themselves have so far not been included in the project.

Appendix 1 - Quick scan

Heading:
author(ess) of this analysis

Jostein Gaarder / The Orange Girl / Oslo 2003 / C Level

introductory remarks: representative to what extent / link to national heritage - world literature – intercultural literature / cross-media-relations / cultural resonances (valued / much spoken off / present in the media...)

Dimension	Indicator	Description (complicating factors)
<i>General demands for engaging in the book</i>	Time	158 A5 pages (Czech version)
	Interests	The theme of childhood and growing up, seeking for the fundamental values of life, delimitating against the others, family and oneself, but above all confronting the death of someone near (the death of the father). Although the main character is Georg – a boy, both the boys and girls will be addressed. Ages 12 up.

	Reading experience	Mature teen reader; should be able to cope with the recurring theme of death. The book contains a number of retrospectives and short reflections. The letter of Georg's father including the story of the Orange Girl alternates with the story of George that takes place in present time. The reader should be able to distinguish these two time level and understand that in fact it is Georg who tells the story in the book.
	General knowledge	No specific knowledge needed, though some basic political and astronomical (the Hubble's telescope) matters occur. The demands lie in life and reader experience. No further knowledge of Norwegian realia required, all the young reader will need is presented in the book.
	Domain specific knowledge	No specific knowledge required.
<i>Familiarity with literary style</i>	Vocabulary	Present-day colloquial language prevails. The symbolic character is embodied in the story itself and its strength; there is almost no figurative language in a lexical layer. Some terms of astrology occur, but they are used in context so they are easily understandable.
	Sentence construction	The narrative layer of the father's letter: written discourse, yet close to spoken language in its syntactic and lexical aspects. The commentary of the main character: close to the spoken language of a teen child.
	Stylistics	Relatively simple language without figurative meaning (see above).
<i>Familiarity with literary procedures</i>	Action	A terminally ill father writes a letter to his son Georg. Georg is only about four when his father dies. His father is aware of the fact that his son is too young to understand the message of the letter. The father intends George to read the letter when he comes of age, so he hides the letter into a baby coach and wishes it not to be thrown away after his death. The essence of the letter is the story about the Orange Girl (who is, as we realize at the end of the letter, Georg's mother). It is not only a love story, it is a tale of life way, a tale worth of deeper reflection.

Chronology	There are two or in fact three parallel storylines: one is the story of the Orange Girl and Georg's father who wanted to find out who the girl was since the day he met her in a tram; the other are the father's commentaries as he made them when he was writing the letter; and the third line is reading the letter by Georg.						
Storyline(s)	Georg's father feels that he is seriously ill. He decides to write a letter to his little son that should be read when his son grows up. When Georg is 15, his grandmother finds that letter. Georg reads it in a short time and adds his commentary and reflections. That is how the book <i>The Orange Girl</i> comes into being.						
Perspective	Personal narrator. The tale of the Orange Girl is a first-person narrative (narrated by Georg's father); Georg's "book" (written after the discovery of the letter on his father's computer) is a first-person narrative, too.						
Meaning	The meaning of the book lies in the message that the father transmits to his son via the letter. Georg can confront with the life story of his father (and mother) and put up with death and finiteness.						
<i>Familiarity with literary personages</i>	<table border="0"> <tr> <td style="vertical-align: top; padding-right: 20px;">Characters</td> <td>Georg: calm, even-tempered, clever. Georg's father: a kind of hero, he was able to accept his inescapable end and did not linger to pass on his message. Georg's mother: the ideal of Georg's father and beloved mother.</td> </tr> <tr> <td style="vertical-align: top; padding-right: 20px;">Number</td> <td>One main character - Georg - followed by his father and mother (the Orange Girl) and his family.</td> </tr> <tr> <td style="vertical-align: top; padding-right: 20px;">Relations</td> <td>Simple relations; the only complication for readers may be how the story of the Orange Girl is developing (when it comes out that the Orange girl is Georg's mother).</td> </tr> </table>	Characters	Georg: calm, even-tempered, clever. Georg's father: a kind of hero, he was able to accept his inescapable end and did not linger to pass on his message. Georg's mother: the ideal of Georg's father and beloved mother.	Number	One main character - Georg - followed by his father and mother (the Orange Girl) and his family.	Relations	Simple relations; the only complication for readers may be how the story of the Orange Girl is developing (when it comes out that the Orange girl is Georg's mother).
Characters	Georg: calm, even-tempered, clever. Georg's father: a kind of hero, he was able to accept his inescapable end and did not linger to pass on his message. Georg's mother: the ideal of Georg's father and beloved mother.						
Number	One main character - Georg - followed by his father and mother (the Orange Girl) and his family.						
Relations	Simple relations; the only complication for readers may be how the story of the Orange Girl is developing (when it comes out that the Orange girl is Georg's mother).						

Primary Paper Section: A

Secondary Paper Section: AM

THE VANISHING INTERIM REGIME HYPOTHESIS

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Abstract: The paper verifies the strong and weak versions of the vanishing interim regime hypothesis. It is shown that the both versions of this hypothesis may be discredited. Results of the logistic model are in favor of the bipolar view only for the advanced countries, providing at the same time a strong support for the view that the probability of the use of interim regimes in emerging and developing countries significantly differs in various regions of the world.

Keywords: bipolar view, exchange rate regimes.

1 Introduction

Since the 1970s the interdependence of the world economy has grown to the unprecedented extent. This in turn has caused the increase in frequency and magnitude of capital flows, mostly of a speculative nature. The magnitude of these flows has become enormously high. As yield differentials have increasingly stimulated capital flows, sustaining restrictions on such flows has become very problematic because of their vanishing effectiveness (Kose et al. 2007). Taking this into account, many countries have already liberalized restrictions on capital flows (Mussa et al. 1994, Kose, Prasad 2007).

Observations of this process have induced many economists to insist that so-called interim exchange rate regimes with the particular emphasis on soft pegs do not fit changing macroeconomic circumstances anymore. It has been often argued that mounting problems with speculative attacks, fading credibility of interim regimes in the world of vastly expanding capital flows and proneness of such regimes to currency crises sooner or later must force countries to reject these regimes as obsolete (Calvo, Mishkin 2003, Eichengreen 1999b). This is the core of so-called bipolar view or vanishing interim regime hypothesis. According to its succinct hard version, all intermediate regimes are about to disappear (Eichengreen, Razo-Garcia 2006). Soft version of this hypothesis was formulated by S. Fischer (2001). According to it, for countries open to international capital flows: (i) soft exchange rate pegs are not sustainable; but (ii) a wide variety of flexible rate arrangements remain possible; and (iii) it is to be expected that policy in most countries will not be indifferent to exchange rate movements.

The conventional wisdom that sooner or later interim regimes cease to be an option in exchange rate policy has become well established since the outbreak of crises during the 1990s (Crockett 2003), even though some economists have emphasized the lack of its clear-cut empirical verification (e.g. Bird, Rowlands 2005, Frankel 2003, Rogoff et al. 2003). The outburst of the global crisis has changed this view. Since then, advantages of interim regimes have started attracting the attention of the academics and policymakers once again.

Taking it under consideration, we attempt to verify the strong and weak versions of the vanishing interim regime hypothesis. First, we briefly characterize the classification of exchange rate regimes used in the paper and present changes in the structure of the exchange rate regimes of the IMF members during the last decade. Then we describe framework of the logistic regression analysis, according to which the probability of the use of intermediate and corner solutions by the IMF members is estimated. Finally, we present the results of the analysis.

2 The exchange rate regimes of the IMF members

This paper uses the classification presented in IMF Annual Reports concerning de facto exchange rate policies. Such classification is a result of the IMF staff analysis concerning phenomena observed in the foreign exchange market and judgement, whether monetary authorities keep to their formal declarations. In the classification countries are categorized on the basis of these policies with the use of the IMF nomenclature introduced in 1999 (Table 1).

Table 1 Exchange rate regimes of the IMF members

Group	Category	Type of regime	Main rules of the exchange rate regime
	hard pegs	(1) <i>exchange arrangement with no separate legal tender</i>	the currency of another country circulates as the sole legal tender; the complete surrender of the monetary authorities' control over domestic monetary policy
		(2) <i>currency board arrangement</i>	explicit legislative commitment to exchange the domestic currency for a specified foreign currency at a fixed rate, combined with restrictions on the issuing authority to ensure the fulfilment of this legal obligation; little space for discretionary monetary policy
fixed pegs	intermediate regimes	(3) <i>conventional fixed peg arrangement</i>	a country pegs its currency within margins of $\pm 1\%$ or less vis-à-vis 1) another currency, 2) a cooperative arrangement, such as the ERM II, or 3) a basket of currencies; exchange rate may fluctuate within narrow margins of less than $\pm 1\%$ around a central rate or the maximum and minimum value of the exchange rate may remain within a narrow margin of 2% for at least 3 months; the fixed parity maintained via direct or indirect interventions, traditional central banking functions still possible
		(4) <i>pegged exchange rate with horizontal bands</i>	exchange rate maintained within certain margins of fluctuation of more than $\pm 1\%$ around a fixed central rate or the margin between the maximum and minimum value of the exchange rate exceeds 2%; currency can be peg to a single currency, a currency composite, or as a result of a cooperative arrangement; rather limited degree of monetary policy discretion
		(5) <i>crawling peg</i>	exchange rate adjusted periodically in small amounts at a fixed rate or in response to changes in selective quantitative indicators; the rate of crawl set according to inflation rate changes or to other indicators (backward looking), or set at a preannounced fixed rate and/or below the projected inflation differentials (forward looking); constraints on monetary policy similar to those in a fixed peg system
		(6) <i>exchange rate with crawling bands</i>	exchange rate maintained within certain fluctuation margins of at least $\pm 1\%$ around a central rate, or the margin between the maximum and minimum value of the exchange rate exceeds 2% and the central rate or margins are adjusted periodically at a fixed rate or in response to changes in selective quantitative indicators; bands either symmetric around a crawling central parity or widen gradually with an asymmetric choice of the crawl of upper and lower bands (in the latter case, there may be no preannounced central rate); constraints on monetary policy, the degree of its independence is a function of the band width

Group	Category	Type of regime	Main rules of the exchange rate regime
floating regimes	tightly managed floats	(7) managed floating with no predetermined path for the exchange rate	monetary authorities attempt to influence exchange rate without having a specific exchange rate path or target; indicators to manage the exchange rate are broadly judgmental (e.g., balance of payments position, international reserves etc.), and adjustments may not be automatic; intervention may be direct or indirect
	other floating regimes	(8) independently floating	exchange rate is market-determined, without official foreign exchange market intervention; monetary authorities prevent undue exchange rate fluctuations rather than stabilize exchange rate

Source: Bubula, Ötker-Robe (2004, 2002), IMF (2007).

De jure classification (published in Reports on Exchange Arrangements and Exchange Restrictions), which is based on official statements of the IMF members concerning implemented exchange rate regimes, is rejected, as many countries simply do not comply with their obligations and break officially announced commitments that should govern the behaviour of the exchange rate (Masson 2000, Poirson 2001).

In this very classification, 8 different exchange rate regimes are distinguished. Regimes can be divided into three groups and four categories (Table 1)¹. The group of fixed pegs consists of hard pegs and soft pegs. Floating regimes and tightly managed floats make floating regimes. On the other hand, soft pegs and tightly managed floats can be incorporated into intermediate regimes. In this respect, hard pegs and floating regimes are corner solutions.

Table 2 Exchange rate regimes of the IMF members in the years 1999-2008

Exchange rate regime ^a	Number of countries									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1)	6	6	7	8	9	9	9	9	10	10
(2)	14	14	14	14	13	13	13	13	13	13
(3)	58	59	58	55	56	55	56	63	70	68
(4)	8	6	6	5	5	4	5	6	5	3
(5)	6	5	4	4	5	5	5	5	6	8
(6)	9	7	5	6	5	5	1	0	1	2
(7)	25	27	33	42	46	49	52	53	48	44
(8)	59	61	59	52	48	47	46	38	35	40
Interim regimes (3+4+5+6+7)	106	104	106	112	117	118	119	127	130	125
Soft pegs (3+4+5+6)	81	77	73	70	71	69	67	74	82	81
Overall	185	185	186	186	187	187	187	187	188	188

^a Exchange rate regimes are numbered as in Table 1.

Source: own calculations based on IMF (1999-2008).

In order to test the bipolar view, the evolution of exchange rate regimes of the IMF members in the years 1999-2008 is analyzed

¹ Since 1999 IMF has modified rules of de facto classification. Effective January 1, 2007, exchange arrangements of the countries that belong to a monetary or currency union in which the same legal tender is shared by the members of the union are classified under the arrangement governing the joint currency. The new classification is based on the behaviour of the common currency, whereas the previous classification underlined the lack of a separate legal tender. In order to provide a comparability of the classification in the whole analyzed period, it appropriate changes are implemented to the classification for the years 1999-2006 as well.

(Tables 2-3). One may observe there a sharp decrease in the number of corner solutions. This phenomenon is even more eye-striking in emerging and developing countries, as these countries have increasingly used the intermediate regimes.

Interestingly, the number of soft pegs also increased. After an initial decline in the number of these regimes in the years 1999-2005, the trend was reversed. Since 2006, the popularity of soft pegs has grown once again. As in case of interim regimes, this phenomenon it is more evident in the group of emerging and developing countries: in 1999 only 77 countries from this very group used soft pegs and in 2008 – 80.

Table 3 Exchange rate regimes of the emerging and developing IMF members in the years 1999-2008

Exchange rate regime ^a	Number of countries									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1)	5	5	6	7	8	8	8	8	9	9
(2)	13	13	13	13	12	12	12	12	12	12
(3)	58	59	58	55	56	55	56	63	70	67
(4)	5	3	4	3	3	2	3	4	3	3
(5)	6	5	4	4	5	5	5	5	6	8
(6)	8	6	4	5	4	4	1	0	1	2
(7)	23	25	31	41	45	48	51	52	47	43
(8)	39	41	37	29	25	24	22	14	10	13
Interim	100	98	101	108	113	114	116	124	127	123
Soft pegs	77	73	70	67	68	66	65	72	80	80
Overall	157	157	157	157	158	158	158	158	158	157

^a Exchange rate regimes are numbered as in Table 1.

Source: own calculations based on IMF (1999-2008).

Following presented data, it is logical to notice that soft pegs are still a monetary policy option in emerging and developing countries. It has to be stressed that such regimes are used almost exclusively by these very countries. In 2008 only one advanced country – Denmark – implemented the regime of a soft peg type (it was conventional fixed peg arrangement).

On the other hand, there was significant growth in the number of advanced economies that fully floated their currencies. On April 30, 1999 there were 20 such countries, and on April 30, 2008 number of these countries increased by a further 7. Countries, that have been included into this group were, among others, Cyprus, Greece, Malta and Slovenia. Taking this into account, it can be concluded that the intensification of the process of the European monetary integration and the admission of new members to the euro zone was an important cause of growth in the number of advanced countries using a corner regime in form of independent floating exchange rate regime.

3 The model

In order to identify the IMF members' choices between corner and interim solutions, a logistic model is used:

$$y_i^* = \beta_0 + \sum_{j=1}^5 \beta_j X_{ij} + \sum_{k=1}^6 \beta_k R_{ik} + \varepsilon_i \tag{1}$$

In equation (1) i means cases (i.e. every country in every year in the 1999-2008 period); j, k – are numbers of independent variables, β are unknown structural coefficients that determine strength and direction of the influence of independent variables on dependent variable

ε_i , ε_i is a random error in the i -th case. y_i^* is a binary variable

and takes on values 1 if in the i -th case an interim regime is used and 0 if in the i -th case a corner regime is used:

$$y_i^* = \frac{(1 \text{ if in the } i\text{-th case an interim regime is used})}{(0 \text{ if in the } i\text{-th case a corner regime is used})} \quad (2)$$

The logistic model can be rewritten in terms of the odds of an event occurring – the ratio of the probability that it will occur to the probability it won't. Such logistic transformation allows rewriting equation (1) in terms of the log of the odds:

$$\ln \left(\frac{P_i}{1-P_i} \right) = \beta_0 + \sum_{j=1}^5 \beta_j X_{ij} + \sum_{k=1}^6 \beta_k R_{ik} + \varepsilon_i \quad (3)$$

where $\left(\frac{P_i}{1-P_i} \right)$ is the odds ratio that the i -th case will be included to cases, in which interim regime is used, to the probability of the opposite.

Verification of both hard and soft versions of the vanishing interim regime hypothesis required two approaches while determining values of y_i^* . Namely, in the first case variable y_i^* takes value of 1 if in the i -th case *soft pegs* or *managed floats with no predetermined path for the exchange rate* is used. In the second one, variable y_i^* equals 1 only if in the i -th case a *soft peg* is used. Such approach allows estimating two versions of the equation (1).

As the main subject of the research is to grasp changes in the IMF classification of exchange rate regimes as well as changes of monetary authorities' decisions concerning these regimes, and not to measure the exchange rate duration, implemented logistic model implies that the choice of exchange rate regime in a given year is independent from the past choices. However, it should be emphasized that when examining the causal relationships that occur between the type of exchange rate regime and economic processes in the country, such a static approach has some weaknesses. This matter will be further considered.

Verification of both hard and soft versions of the vanishing interim regime hypothesis required two approaches while determining the value of y_i . Hence, using the first approach variable y_i takes value of 1 for soft pegs and managed floats with no predetermined path for the exchange rate. In the second one, variable y_i equals 1 only if in the i -th case a soft peg is used. Implementation of the two approaches allows estimating two versions of the equation (1).

Then, it is assumed, that 5 independent variables may affect y_i variable: X_1 – year-on-year changes of constant price GDP, X_2 – GDP based on purchasing-power-parity (PPP), share of world total, X_3 – inflation rate, X_4 – modulus of the current account balance as a % of GDP, X_5 – foreign exchange as a % of GDP. Moreover, in order to capture the differences between the probability of the use of interim and corner solutions in emerging and developing countries from different regions of the world, a dummy variable R_{ik} is introduced to the model². R_{ik} takes on the value of 1, if the i -th case from the group of emerging and developing countries belongs to the region k and the value of 0 in the opposite situation.

According to the classification of the *World Economic Outlook*, six such regions are distinguished: R_1 – Central and Eastern Europe, R_2 – Africa, R_3 – Asia, R_4 – Commonwealth of Independent States and Mongolia, R_5 – Middle East, R_6 – Western Hemisphere.

In order to estimate the models, macroeconomic indicators and forecasts for the IMF members are used, according to the *Word*

Economic Outlook Database, as well as *IMF Annual Reports* data on exchange rate policies. Elimination of cases for which data appeared to be unavailable yielded a database of 1690 different cases.

4 Results of the logistic analysis

Table 4 contains estimated coefficients and related standard errors (in parenthesis) of the two logistic models that predict the probability of the use of corner and interim solutions by the IMF members. As signalled, in the first model variable y_i takes value of 1 if in the i -th case soft peg or managed floating regime is used. In the second model, variable y_i equals 1 only if in the i -th case a soft peg is used. Variables included in the models are statistically significant (using a significance level of 0,1). Both models fit the data quite well. The ability to predict the use of interim regimes is presented in Table 5.

In both models theoretical value of the probability, (\hat{y}_i) is negatively affected by GDP based on purchasing-power-parity (PPP), share of world total (X_2) and the modulus of the current account balance as a % of GDP (X_4) and in the second model also by the inflation rate (X_3). Foreign exchange as a % of GDP (X_5) has a positive influence on the \hat{y}_i values of the two models, whereas the year-on-year changes of constant price GDP influences positively only the \hat{y}_i value in the first model.

Table 4 Parameter estimates for the logistic regression models

Variables	Model 1			Model 2		
	B	S.E.	Sig.	B	S.E.	Sig.
X_0	0,32	0,14	0,02	-0,40	0,12	0,00
X_1	0,04	0,01	0,01	-	-	-
X_2	-0,24	0,06	0,00	-0,16	0,06	0,00
X_3	-	-	-	-0,02	0,01	0,00
X_4	-0,03	0,01	0,00	-0,01	0,01	0,03
X_5	0,04	0,53	0,00	0,02	0,40	0,00
R_1	-0,71	0,16	0,00	-0,41	0,16	0,01
R_2	0,60	0,13	0,00	0,44	0,11	0,00
R_3	0,80	0,18	0,00	0,42	0,14	0,00
R_4	0,37	0,22	0,08	-0,10	0,23	0,00
R_5	1,86	0,35	0,00	2,40	0,27	0,00
R_6	-0,43	0,13	0,00	-0,21	0,13	0,09

Source: own calculations.

Table 5 Classification table

Observed	Predicted	
Model 1		
Corner regime	328 (51,8%)	305
Interim regime	78	979 (92,6%)
Overall percentage	77,8%	
Model 2		
Corner regime	871 (84,7%)	157
Interim regime	319	343 (51,8%)
Overall percentage	69,2%	

Source: own calculations.

Achieved results partially support the view that emerging and developing countries are more prone to use interim regimes, as their GDP growth is usually faster and the share in the world GDP based on purchasing-power-parity is lower than in advanced economies. The link between the magnitudes of the foreign exchange relative to the GDP with exchange rate regime is also of a clear-cut character. Countries that use corner solutions do not need large volumes of foreign exchange. Under pure floating regimes they are *per se* needles, and under hard

² In order to avoid a dummy variable trap, R_{ik} for cases from the group of advanced countries equals zero.

pegs high level of credibility provided by such regimes can also weaken the need for foreign exchange accumulation.

It is a bit surprising, however, that parameters estimated for the modulus of the current account balance as a % of the GDP in both models and for the inflation rate in the second model are negative. This challenges the common view that corner regimes are favourable to disinflation as monetary authorities can fully concentrate on restoring an internal balance whereas hard pegs increase anti-inflationary credibility of the monetary authorities via the use of an official exchange rate as a solid nominal anchor, allowing them to achieve a sustainable reduction in inflation rate. Similarly, it is often assumed that corner regimes are associated with smaller external imbalance. Under floating regimes changes of the exchange rate should provide buffer for imbalance accumulation. On the other hand, preserving external balance appears to be one of preconditions for hard pegs' effective functioning as mounting current account deficit or surplus can trigger speculative attack off, thus undermining official exchange rate supported by the central bank. However, signs of estimated parameters show that in some cases the use of the corner regime doesn't lead *per se* to a reduction in the rate of inflation, nor to achieve external balance. To put it in more explicitly – corner regimes don't always protect from high inflation rates and mounting current account deficits.

Comparison of the two models leads to another conclusion. As shown in Table 4, variable X_1 appears to be statistically significant only in the first model, whereas variable X_3 – only in the second one. Hence, achieved results indicate that countries under managed floats suffer from higher inflation rate but achieve higher real GDP growth, than these under soft pegs. This is quite interesting, as usually higher real GDP growth and inflation rate are considered to be characteristic for the whole group of flexible regimes, capturing both independently floating regimes and managed floats (Markiewicz 2006). However, achieved results indicate that there are differences between the two regimes concerning real GDP growth and inflation rate, as these variables tend to be significantly higher in countries under managed floating regimes.

Inclination to use interim regimes is different in emerging and developing countries in various regions of the world. In both models \hat{y}_i takes the highest values for countries from the Middle East. Moreover, increases for Asian and African countries and decreases for CEECs and Western Hemisphere. Estimated models provide divergent results for CIS and Mongolia. Different magnitude and direction of influence of the R_{ik} variable can be interpreted as an evidence of the existence of other factors that influence emerging and developing countries' choices concerning exchange rate regimes, partly resulting from differences in institutional fundamentals and different economic structures as well as macroeconomic policy stabilization programs. Due to this lack of homogeneity countries can to different extent manifest the “fear of pegging” and “fear of floating”. According to them, monetary authorities may tend to smooth exchange rate movements, even though they have no official commitment to maintaining the official central exchange rate (Calvo, Reinhart 2000) or on the other hand, monetary authorities can claim to have a pegged exchange rate, in fact carrying out frequent changes in reference exchange rate (Alesina, Wagner 2006).

Conducted analysis allows to find out what are the threshold values of variables that – if put into models – result in high values of \hat{y}_i . Such threshold values can be also identified in the ranking of analyzed cases in Tables 6-9. Countries with relatively high real GDP growth, very low share in the world GDP based on the purchasing-power-parity (0,1% and less), modest inflation rate and high share of reserves of foreign currencies in GDP are classified high in the ranking. It is interesting, however, that there is no such straight dependence between the theoretical value of the probability and the external imbalance – countries with balanced current account got up to the top of the ranking as well as countries suffering from mounting deficits.

Table 6 Ranking of cases according to the probability of the use of the interim regime (model 1, ranks 1-15)

Ranking ^a	Country	Year	Model 1						
			\hat{y}_i	X_1	X_2	X_4	X_5	R^b	y^*
1	Libya	2007	0,997	7,5	0,1	40,7	108,7	5	1
3	Botswana	2000	0,996	5,9	0,0	9,7	110,8	2	1
3	Botswana	1999	0,995	9,8	0,0	10,5	105,0	2	1
4	Libya	2006	0,995	6,7	0,1	44,6	102,5	5	1
5	Libya	2008	0,994	3,4	0,1	40,7	101,0	5	1
6	Lebanon	2008	0,993	8,5	0,1	11,6	68,8	5	1
7	Libya	2003	0,993	13,0	0,1	19,9	69,3	5	1
8	Libya	2005	0,993	10,3	0,1	38,9	86,8	5	1
9	Botswana	2002	0,993	9,0	0,0	3,2	88,3	2	1
10	Botswana	2001	0,992	3,5	0,0	9,9	96,2	2	1
11	Libya	2004	0,990	4,4	0,1	21,4	70,2	5	1
12	Libya	2002	0,990	-1,3	0,1	3,0	60,0	5	1
13	Lebanon	2003	0,989	4,1	0,1	13,2	62,9	5	1
14	Lebanon	2006	0,989	0,6	0,1	5,3	59,3	5	1
15	Jordan	2004	0,988	8,6	0,0	0,8	46,1	5	1

^a Ranking is created according to non-growing probabilities of the use of the interim regime.

^b $R = 0$ means that country belongs to the group of advanced economies.

Source: own calculations.

Table 7 Ranking of cases according to the probability of the use of the interim regime (model 2, ranks 1-15)

Ranking ^a	Country	Year	Model 2						
			\hat{y}_i	X_1	X_2	X_4	X_5	R^b	y^*
1	Libya	2007	0,957	0,1	6,2	40,7	108,7	5	1
3	Libya	2002	0,956	0,1	-9,9	3,0	60,0	5	1
3	Libya	2006	0,955	0,1	1,4	44,6	102,5	5	1
4	Libya	2008	0,949	0,1	10,4	40,7	101,0	5	1
5	Libya	2003	0,947	0,1	-2,1	19,9	69,3	5	1
6	Libya	2005	0,945	0,1	2,9	38,9	86,8	5	1
7	Libya	2004	0,944	0,1	1,0	21,4	70,2	5	1
8	Lebanon	2003	0,943	0,1	1,3	13,2	62,9	5	1
9	Lebanon	2006	0,941	0,1	5,6	5,3	59,3	5	1
10	Lebanon	2008	0,940	0,1	10,8	11,6	68,8	5	1
11	Lebanon	2005	0,937	0,1	-0,7	13,4	54,1	5	1
12	Jordan	2004	0,934	0,0	3,4	0,8	46,1	5	1
13	Lebanon	2007	0,934	0,1	4,1	6,8	51,3	5	1
14	Lebanon	2004	0,933	0,1	1,7	15,5	54,4	5	1
15	Libya	2001	0,933	0,1	-8,8	12,3	40,4	5	1

^a Ranking is created according to non-growing probabilities of the use of the interim regime.

^b $R = 0$ means that country belongs to the group of advanced economies.

Source: own calculations.

Table 8 Ranking of cases according to the probability of the use of the interim regime (model 1, ranks 1676-1690)

Ranking ^a	Country	Year	Model 1						
			\hat{y}_i	X_1	X_2	X_4	X_5	R^b	y^*
1676	Japan	1999	0,200	-0,1	7,8	2,6	6,4	0	0
1677	Chad	2002	0,179	8,5	0,0	94,7	10,9	2	1
1678	Timor-Leste	2006	0,026	-5,8	0,0	165,2	25,6	3	0
1679	USA	2008	0,008	0,4	20,6	4,9	0,3	0	0
1680	USA	2007	0,008	2,1	21,1	5,2	0,3	0	0
1681	USA	2006	0,007	2,7	21,7	6,0	0,3	0	0
1682	USA	2005	0,006	3,1	22,1	5,9	0,3	0	0
1683	USA	2004	0,006	3,6	22,4	5,3	0,4	0	0
1684	USA	2003	0,006	2,5	22,7	4,7	0,4	0	0
1685	USA	2002	0,005	1,8	22,9	4,3	0,3	0	0
1686	USA	1999	0,005	4,8	23,7	3,2	0,3	0	0
1687	USA	2000	0,005	4,1	23,5	4,2	0,3	0	0
1688	USA	2001	0,005	1,1	23,2	3,9	0,3	0	0
1689	Timor-Leste	2007	0,002	8,4	0,0	296,1	57,9	3	0
1690	Timor-Leste	2008	0,000	12,8	0,0	408,3	42,2	3	0

^a Ranking is created according to non-growing probabilities of the use of the interim regime.

^b $R = 0$ means that country belongs to the group of advanced economies.

Source: own calculations.

Table 9 Ranking of cases according to the probability of the use of the interim regime (model 2, ranks 1676-1690)

Ranking ^a	Country	Year	Model 2						
			\hat{y}_i	X_1	X_2	X_4	X_5	R^b	y^*
1676	USA	2008	0,020	20,6	3,8	4,9	0,3	0	0
1677	USA	2007	0,018	21,1	2,9	5,2	0,3	0	0
1678	USA	2006	0,016	21,7	3,2	6,0	0,3	0	0
1679	Timor-Leste	2008	0,016	0,0	7,6	408,3	42,2	3	0
1680	USA	2005	0,015	22,1	3,4	5,9	0,3	0	0
1681	USA	2004	0,015	22,4	2,7	5,3	0,4	0	0
1682	USA	2003	0,014	22,7	2,3	4,7	0,4	0	0
1683	USA	2002	0,014	22,9	1,6	4,3	0,3	0	0
1684	USA	2001	0,013	23,2	2,8	3,9	0,3	0	0
1685	USA	2000	0,013	23,5	3,4	4,2	0,3	0	0
1686	USA	1999	0,012	23,7	2,2	3,2	0,3	0	0
1687	Belarus	2000	0,012	0,1	168,6	3,2	3,4	4	0
1688	Angola	1999	0,010	0,1	248,2	27,5	8,1	2	1
1689	Angola	2000	0,003	0,1	325,0	8,7	13,1	2	0
1690	Belarus	1999	0,001	0,1	293,7	1,6	2,4	4	0

^a Ranking is created according to non-growing probabilities of the use of the interim regime.

^b $R = 0$ means that country belongs to the group of advanced economies.

Source: own calculations.

The ranking supports conclusions which have been already formulated. It occurs that the countries at the forefront of the ranking come from the Middle East and Africa. Among the first 100 cases in the ranking based on the first model 70 are cases from the Middle East (56) and Africa (14). In the ranking based on the second model all first hundred places fall to countries from the Middle East. It proves once again that the probability of the use of the interim regime in countries from these regions is especially high.

To sum up, emerging and developing countries are not prone to renege on interim regimes as fast, as proponents of the bipolar view believe. Implementing a hard peg unilaterally requires abiding very tough monetary rules concerning money supply (like for example under currency board arrangement). Introducing a hard peg in a multilateral manner means joining the monetary union, what in turn requires the fulfilment of strict economic criteria and must be accepted by other members of such union. Enlargement of monetary union is hence a long-lasting and sometimes very painful process.

On the other hand, the extensive institutional and operational requirements needed to support a floating exchange rate as well as difficulties in assessing the right time of the exit from peg dampen the move towards pure floating corner of the Impossible Trinity triangle (Calvo, Reinhart 2000). That's why managed floating regimes and soft pegs appear to be more durable, as usually assumed.

5 Conclusions

Conducted research challenge the bipolar view. During the analyzed period number of the interim regimes in emerging and developing countries doubled. The share of soft pegs in overall regimes in the years 1999-2008 was relatively stable, fluctuating around 50 %, whereas the share of the whole group of interim regimes increased from 64 % to 78 %. The evolution of the interim regimes is then opposite to what is assumed by the authors and supporters of the vanishing interim regime hypothesis.

Results of the logistic analysis also don't support the bipolar view. The analysis of the probabilistic curves allows to notice that the \hat{y}_i value approaches 0,01 only when the share of a specific country in the world GDP based on the purchasing-power-parity reaches 23 % (model 1) or 25 % (model 2). For the sake of comparison – share of the U.S. economy in the world GDP based on the purchasing-power-parity fluctuated in the years 1999-2008 in the range of 20,6 %-23,7 %. Moreover, as shown in Table 10, \hat{y}_i lowers if at least one of variables X_2 , X_3 and X_4 reaches extremely high values. It has to be underlined, however, that such phenomena are not typical for a normal economic situation. High inflation rates as well as deep external imbalance are rather a sign of an unusual shock that affects the economy.

It is reasonable then to agree with Calvo and Mishkin (2003) that the exchange rate regime choice is rather in the background of the structure of the economy and a whole package of macroeconomic policies. Exchange rate regimes are not to be blamed for the inappropriate functioning of the domestic economy, they are also not a panacea to eliminate economic disturbances. Openness to capital flows is only one among the variety of economic and political factors influencing the choice of the exchange regime. This is why, the bipolar view eventually – if ever – may be positively verified in the very (very) long run. This makes this view of little relevance to the contemporary macroeconomics.

Literature:

1. Alesina, A., Wagner, F. *Choosing (and Reneging on) Exchange Rate Regimes*. Journal of the European Economic Association 2006, Vol. 4, No. 4.

2. Bird, G., Rowlands, D. *Bi-polar Disorder: Exchange Rate Regimes, Economic Crises and the IMF*. University of Surrey Discussion Papers in Economics 2005, DP 07/05.
3. Bubula, A., Ötker - Robe, I. *The Evolution of Exchange Rate Regimes Since 1990: Evidence from De Facto Policies*. IMF Working Paper 2002, No. 155.
4. Bubula A., Ötker-Robe I. *The Continuing Bipolar Conundrum*. Finance & Development 2004, Vol. 41, No. 1.
5. Calvo, G.A., Mishkin, F.S. *The Mirage of Exchange Rate Regimes for Emerging Market Economies*. Journal of Economic Perspectives 2003, Vol. 17, No. 4.
6. Calvo, G., Reinhart, C. *Fear of Floating*. NBER Working Paper 2000, No. 7993.
7. Crockett, A. *Exchange rate regimes in theory and practice*. [in:] P. Mizen (ed.), *Monetary History, Exchange Rates and Financial Markets. Vol. 2*. Cheltenham-Northampton: Edward Elgar 2003. 292p. ISBN 1843768410.
8. Eichengreen, B. *Toward A New International Financial Architecture: A Practical Post-Asia Agenda*. Washington: Institute for International Economics 1999. 200p., ISBN 0881322709.
9. Eichengreen, B., Razo-Garcia, R. *The international monetary system in the last and next 20 years*, Economic Policy 2006, Vol. 21, No. 47.
10. Fischer, S. *Distinguished Lecture on Economics in Government. Exchange Rate Regimes: Is the Bipolar View Correct?* The Journal of Economic Perspectives 2001, Vol. 15, No. 2.
11. Frankel J.A. *Experience of and Lessons from Exchange Rate Regimes in Emerging Economies*. NBER Working Paper 2003, No. 10032.
12. IMF, *Annual Report*, Washington DC, years 1999-2008.
13. Kose, M.A., Prasad, E., Rogof, K., Wei, S. *Beyond the Blame Game. A new way of looking at financial globalization reexamines its costs and benefits*, [in:] *Financial Globalization. The impact on trade, policy, labor and capital flows*. A compilation of articles from Finance & Development. Washington: IMF 2007.
14. Kose, M.A., Prasad, E. *Liberalizing Capital Account Restrictions*, [in:] *Financial Globalization. The impact on trade, policy, labor and capital flows*. A compilation of articles from Finance & Development. Washington: IMF 2007.
15. Masson, P. *Exchange Rate Regimes Transitions*, IMF Working Paper 2000, No. 134.
16. Markiewicz, A. *Choice of exchange rate regime in transition economies: An empirical analysis*, Journal of Comparative Economics 2006, Vol. 34, No. 3.
17. Mussa, M., Goldstein, M., Clark, P.B., Mathieson, D.J., Bayoumi, T. *Improving the International Monetary System*, IMF Occasional Paper 1994, No. 116.
18. Rogoff, K.S., Husain, A.M., Mody, A., Brooks, R., Oomes, N. *Evolution and Performance of Exchange Rate Regimes*, IMF Working Paper 2003, No. 243.

Primary Paper Section: A

Secondary Paper Section: AH

THE INFLUENCE OF BALANCED SCORECARD IMPLEMENTATION ON VALUE OF OIL COMPANY – THE CASE OF MOBIL CORPORATION

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Abstract:

This paper presents the analysis of the impact of application of Balanced Scorecard in Mobil United States Marketing and Refining (USM&R) on the value of oil company - Mobil Corporation. By verifying the hypothesis of the creators of the concept of Balanced Scorecard, R. Kaplan and D. Norton, on the occurrence of a significant improvement in profitability of Mobil USM & R, one of the divisions of Mobil Corporation, as a direct effect of the implementation of Balanced Scorecard, the author analyzes the results achieved by this division and by the entire enterprise, checking whether the implementation of the Balanced Scorecard had in fact a positive effect on profitability and value of the entire enterprise.

Keywords: balanced scorecard, value, managerial accountancy, Mobil Corporation

1. Introduction

Balanced Scorecard (BSC) is a tool used in strategic managerial accounting, which task is to measure, evaluate and communicate achievements to translate a strategy into action (Kaplan, Norton, 2002, pp. 29-41), and it is frequently defined as an instrument of value creation (Szychta, 2007). By analyzing the definition above, it can be seen that the Balanced Scorecard combines a number of extremely important, from the enterprise point of view, tasks that were traditionally regarded as separate areas of enterprise internal operations. Such a significant complexity of this tool and its integrating function require a lot of effort and professional knowledge to have it implemented correctly. As a result of proper implementation of Balanced Scorecard it is postulated, inter alia by the creators of the concept, that it causes a significant improvement of profitability and as a result it contributes to increase of value of company.

Since the 1990, when the concept of Balanced Scorecard was presented for the first time, as a result of research project Measuring the effectiveness of organizations led by the future, conducted by Nolan Norton Institute, KPMG's research unit (Kaplan, Norton, 2002), the number of its implementations has been rising until 2008 (Rigby, 2011). The research conducted by Bain and Company has shown that in 2007 66% of tested companies implemented Balanced Scorecard (Rigby, 2007). Despite the decline in the number of implementations recorded in the years 2009-2010, Balanced Scorecard was still the sixth most popular management tool used by executives in 2010 (Rigby, 2011).

As the concept of Balanced Scorecard became more popular, numerous studies have been conducted on the matter of its real effectiveness (eg Otley, 1999, Norreklit, 2003, Davis and Albright, 2004). The lack of clear evidence of Balanced Scorecard effectiveness led De Gausser, Mooraj and Oyon (2009, p. 94) to the need of conducting research which was about to answer the question Does the Balanced Scorecard add value to the companies which implemented it. By analyzing numerous measures of organizational performance, such as management evaluation, cost/benefits, integration and autonomy, they build a model based on answers from 76 companies that implemented Balanced Scorecard, which led them to a conclusion that in general implementation of Balanced Scorecard contributes positively on organization performance (De Gausser, Mooraj, Oyon, 2009, p. 116). Despite the fact, that mentioned research seem to clear the problem of lack of evidence of positive influence of Balanced Scorecard on the value of companies, to have a more significant answer to this problem there is a serious need of conducting numerous case studies analyzing non-aggregated results of implementations.

In this research author tried to find out how did the implementation of Balanced Scorecard influence the

effectiveness and as a result the value of Mobil Corporation in long-term perspective. The case of Mobil Corporation is more important because the process of implementation of Balanced Scorecard in Mobil USM&R, one of the most important divisions of Mobil Corporation, was precisely described by R. Kaplan and D. Norton (Kaplan, Norton 2001). The fact that founders of concept implemented it in Mobil Corporation is a guarantee that the implementation process was coherent and complied with the theory. Also, the research conducted by Kaplan and Norton, based on analysis of profitability and return on capital in Mobil USM&R in the years 1993-1998 has proven occurrence of positive influence of implementation (Kaplan, Norton, 2001). However that type of research, based on absolute numbers does not present the real performance of company on the market and surely can not be extrapolated to the effect on the value of the company.

By analyzing the process of implementation of Balanced Scorecard in Mobil USM&R, with assumption that the results of Mobil USM&R have strong influence on the results of whole company (the assumption is based on the structure of Mobil Corporation and the fact that the contribution of Mobil USM&R results is highly significant for the results of the whole company), by analyzing the results of Mobil USM&R and Mobil Corporation in the years 1991-2011 (also after the merger with Exxon), and by accounting the prices of oil on the American market, the author has tested if in case of Mobil Corporation the implementation of Balanced Scorecard has a positive influence on its value.

2. The design and implementation of balanced scorecard in Mobil USM&R

2.1. The circumstances of the implementation of Balanced Scorecard in Mobil USM&R

In 1992, the Mobil USM&R, a division of Mobil Corporation, held a leading position among the companies supplying petroleum products in North America (Kaplan, Norton, 1996). Although the division has significant market power, at the end of 1992 showed a loss of net profit. Mobil USM&R division in 1992 showed a profit from sale of fuel only in the rate of 0.2 USD per gallon, while in the same period the industry average was 2.2 USD per gallon (Kaplan, Norton, 1996).

A significant decrease in profit, in compare to the previous years and to the industry average has become a reason for the company to seek for new methods of efficiency improvement. By taking under consideration high degree of bureaucratization of division, decreasing efficiency and problems in defining the specific objectives, strategic changes were made, involving the functional organization of the division. The results of this operation were positive, but not significant enough to stop company from seeking for other ways to improve. From the first months of 1994 the process of implementation of Balanced Scorecard in the Mobil USM & R has begun.

2.2. Strategy

The market for petroleum products in North America in the years 1993-1994 was characterized by a well-developed competition within the sector. In the U.S. alone, there functioned simultaneously thirteen companies involved in oil extraction and sales of products manufactured from it. Growing demand for fuel and dynamic development of competition were significant impediment to the formulation of a simple strategy.

The process of formulating the strategy was launched in January 1994. It was conducted by a specially formed team which, with participation of D. Norton, created a list of basic issues affecting the strategy (Kaplan, Norton, 1996). The result of this process was to develop a strategy clear enough to be translated into action and allowing to get the best financial results. In 1994, while most companies in the oil industry, focused solely on

production processes optimization and cost reduction, Mobil gained a new strategy assuming (Kaplan, Norton 2001):

- a) cost reduction and increase of productivity within the entire value chain,
- b) generating higher sales of products and services in the premium segment.

Thus formulated strategy included the markings of a modern market strategy. The will to focus on cost reduction and productivity growth within the entire value chain shows that the company concentration on improvement of the efficiency was not limited only to internal processes. Focusing on the premium segment in that period was also accurate strategic move. The subsequent years have shown that concentration of company's activities on increasing the value delivered to customers, can raise profitability across the enterprise. In conjunction with such a developed strategy, strategic targets and measures were developed within each perspective, compiled in the order characteristic for the industrial enterprises - from a financial perspective, through customer perspective and internal business perspective, finally to innovation and learning perspective.

2.3. BSC implementation process and its results

The Balanced Scorecard has been completely implemented in Mobil USM&R in 1995. The implementation process was supported by information campaign conducted among all employees, with use of brochures containing simplified information on the objectives and expected outcomes of implementation. Under the assumptions of the Balanced Scorecard, the entire division focused on efforts to fulfill the assumptions set out in the perspectives of the card.

Analysis of the process of developing the Balanced Scorecard in Mobil USM & R, its design and implementation processes, shows that the implementation was entirely consistent with the concept of R. Kaplan and D. Norton. The mere fact of extensive publicity about the implementation shows that it can serve as a model example of Balanced Scorecard implementation.. As it was mentioned before, research conducted by the creators of the concept, based on the results of Mobil USM & R in 1993-1998, showed that during this period the financial performance of division, its profitability and return on capital employed improved significantly.

The fundamental problem, which solution was not indicated by the results of those studies, is the extent to which the implementation of Balanced Scorecard has affected the results of Mobil USM&R, and to what extent these results were dependent on market trends, so independent to the organizational changes in the company.

Additionally, in light of widespread attention of all stakeholders of the enterprise to its value and its ability to generate profit when making decisions important for the company, that raises a question about the impact that the Balanced Scorecard has applied in the process of value based management. The case of Mobil USM&R, because of the moment of implementation of the Balanced Scorecard and its circumstances, makes it possible to analyze its effect in the long term.

3. Analysis of the impact of balanced scorecard on financial performance of Mobil USM&R in 1991-2002

One of the main reasons for the implementation of Balanced Scorecard in the Mobil USM & R was a strong decrease in the net financial result in the years 1991-1992. At the end of 1991 the division recorded a profit of 116 millions USD, while at the end of 1992 suffered a loss of 145 millions USD. The management of division acknowledged that the main cause of deterioration of the results was the failure of its operation due to bad organizing, lack of unified policies and inadequate control of changes of the results of individual processes and their causes.

Oil companies are a specific group of enterprises whose results depend directly on the situation on the oil market. The main business of analyzed division is refining crude oil and sale of

products arising as a result thereof. Taking into account that analyzed division is a part of the company which extract crude oil in quantities that meet its own refining needs, it can be concluded that in this case the raw material supplier policy impact on financial results is negligible. It should be also noticed that for a company functioning on a highly competitive market, the market price of its basic raw material has a significant impact on the financial results of a particular company, because it determines the action of competition, while providing a basis to develop a margin which is the main source of profit. In such situation, in order to properly assess the effects of the implementation of Balanced Scorecard in the oil company, it seems necessary to compare the results of the analyzed division with the oil prices. Graph 1 show the financial result of Mobil USM & R (in annual terms), along with oil prices recorded on the U.S. market (on a monthly basis) in 1991-2002.



Graph 1. Summary of financial results of Mobil USM&R and oil prices on the U.S. market in the years 1991 - 2002. Source: data set.

The analysis of the impact of the Balanced Scorecard on the financial results achieved by Mobil USM&R conducted by R. Kaplan and D. Norton pointed out a significant improvement in profitability of the division as a direct result of the implementation of the Balanced Scorecard (Kaplan, Norton, 2001, p. 60-62). The analysis of changes of the financial result of Mobil USM&R shows that the reversal of adverse trends occurred before the start of the process of preparing and implementing of Balanced Scorecard (indicated on the graph by the red line). Since the end of 1993, the division recorded a profit of 115 millions USD. Additionally it may be noticed, that in the years 1991-1997 and 1998 - 2002 there was a significant trend of convergence of the division profit and changes of oil prices. That situation raises the question to what extent the improvement of profitability was due to changes of oil prices, and to what extent was it the result of preparing process and implementation of the Balanced Scorecard.

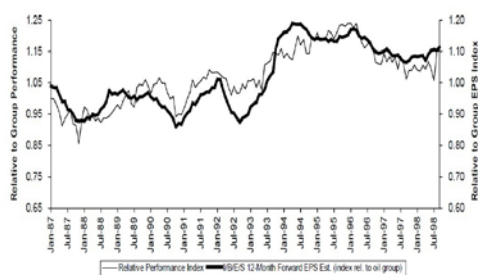
According to the author, the analysis of the effectiveness of the implementation of the Balanced Scorecard based only on the changes of level of profit or level-dependent rates of profit (for example ROCE), cannot reliably demonstrate the actual impact of implementation on the company's performance. Inability to prove this effect makes it also impossible to determine, whether implementation of the Balanced Scorecard has boosted the company's value and effectiveness of value management, which to some extent are reflected in the ability to generate profit, as one of the cornerstones of the evaluation of value. In such circumstances it is necessary to examine how the implementation of the Balanced Scorecard has changed the assessment of company value among the investors.

4. Analysis of the impact of implementation of balanced scorecard in Mobil USM&R on the market value of Mobil Corporation

4.1. Analysis of the value based on the EPS and PI indicators

Mobil USM&R was a division which significantly affected the results of the Mobil Corporation. This thesis is supported by the fact, that within the structure of Mobil Corporation on the U.S. market, Mobil USM&R was responsible for generating profits, while the other divisions, such as the United States Mobil Exploration and Production, mainly generated costs. By 1999, that is until the merger with Exxon Corporation, the results of Mobil USM&R division had a major impact on the assessment of the value of the corporation carried out by the investors.

The valuation made by investors may be based on different grounds. The simplest method of assessing value is to analyze stock prices, but due to the often speculative transactions on the capital market, value of such an assessment may entail considerable risk of error, especially in the short term period. Much more reliable method of assessing value of the company is to analyze the earnings per share (EPS) and to conduct analysis of the performance based on the performance index (PI) in relation to other companies in the sector. The results of such analysis conducted by J.P. Mahedy, Y. Kak and C. Miller for Mobil Corporation in the years 1987 - 1998 are presented in the Graph 2.

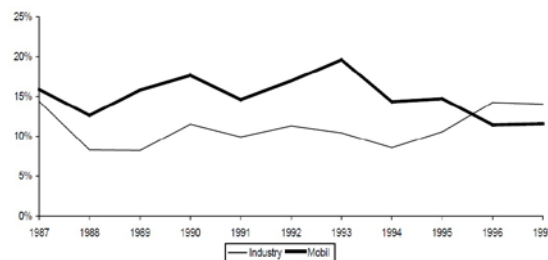


Graph 2. Profits and productivity of Mobil Corporation in relation to the oil sector companies in the U.S. in 1987 - 1998. Source: J.P. Mahedy, Y. Kak, C. Miller, Black Book - Mobil: Will Pegazus Rise to New Heights, Preceding, 1998, p. 10.

By analyzing the situation presented in the graph above, it may be noticed, that after the commencement of the implementation of the Balanced Scorecard in the Mobil USM&R there has marked an increase in indicators of EPS and PI for the sector, but that increase did not constitute a trend reversal, but it was only the continuation of the upward trend apparent since the second half of 1992. After increasing of the level of indicators in the first years after the implementation, and after stabilization in the years 1995-1996, a downward trend revealed, resulting in the approach of the company to the average level of the sector. This situation shows that changes in the company management (including implementation of the Balanced Scorecard) did not produce sustained growth of the entire enterprise value (relative to the sector) and its positive impact can only be seen in the short term. Having presented further in this work the results of analysis of the impact of oil prices on the value of the company, it should be noticed that the results of improvement of profitability of the company during the implementation of BSC (discussed above), could have been caused mainly by the situation on the oil market.

4.2. The analysis based on the ROA value indicator

One of the key financial targets which was to be put into the Balanced Scorecard of Mobil USM&R was to increase the efficient usage of assets. For a proper assessment of the effectiveness of this objective it is necessary to analyze the changes of the rate of return on assets (ROA) for the entire oil sector. This analysis is extremely important, because many investors on the capital market use ROA to assess value of the company. The level of ROA for the Mobil Corporation and the oil sector in the years 1987-1997 is illustrated in the Graph 3.



Graph 3. The level of ROA of Mobil Corporation in relation to the oil sector companies in the U.S. in the years 1987 - 1997.

Source: J.P. Mahedy, Y. Kak, C. Miller, Black Book - Mobil: Will Pegazus Rise to New Heights, Preceding, 1998, p. 10.

As shown in the graph above, the rate of return on assets of Mobil Corporation, after the commencement of the process of developing the Balanced Scorecard in the Mobil USM&R in 1994 showed a slight upward trend, then after the first year of using the Balanced Scorecard, dropped significantly to the level lower than the average for the sector. Although this decline affected the entire enterprise, not just USM&R division in which BSC was implemented, it should be noted that the assessment of the market value of the company must be based on data from the entire organization. To assess the positive impact of the Balanced Scorecard on the value of the company using ROA, it is necessary to take note of stabilization or increase in the level of this indicator. In the years 1996-1997 the level of ROA fell below the average of the sector, which has not been recorded since 1987. Basing on these data, it appears that the implementation of Balanced Scorecard in the Mobil USM&R did not affect the growth of the Mobil Corporation in the analyzed period, or that the impact of that implementation was insufficient to cover the return on assets declines in the other divisions.

5. Analysis of long-term possible impact of the balanced scorecard in Mobil USM&R on the market value of Exxon Mobil Corporation

In 1999 the biggest merger in the history of the U.S. market took place, which resulted in the combination of Exxon Corporation and Mobil Corporation, which since then became Exxon Mobil Corporation. The fact that the merger took place five years after the implementation of the Balanced Scorecard in the Mobil USM&R makes it impossible to carry out a full, long-term analysis of the impact that application of the Balanced Scorecard in Mobil USM&R on the value of Mobil Corporation based on market valuation of the company. However, given the fact that after 1999 the impact of the performance of Mobil USM&R (after the merger the division of Exxon Mobil Corporation) remained significant enough to assess the value of Exxon Mobil Corporation, it is possible to examine the extent of influence of efficiency improvement of the division on the assessment of value taken by the investors.

According to the author, the most effective way to explore this connection is to determine what part of the company's market value, from the investors perspective, could be generated as a result of efforts to improve the efficiency of operation (which could partly be also a result of the implementation of Balanced Scorecard in Mobil USM&R), what can be partially achieved by excluding the impact of changes of oil prices on the U.S. market on the market value of the company. The starting point for analysis is the statement of changes in closing prices of shares of Exxon Mobil Corporation, with oil prices in the U.S. market, as illustrated in the Graph 4.



Graph 4. Statement of the Exxon Mobil company's closing prices on the NYSE and oil prices in the years 1991 - 2011. Source: Own calculations based on Reuters quotes:

<http://www.reuters.com/finance/stocks/chart?symbol=XOM.N>,
and the prices of crude oil:

<http://research.stlouisfed.org/fred2/date/OILPRICE.txt>.

As shown in the graph above, during almost the whole considered period, changes in the market assessment of the value of the company coincided with the changes of oil prices. Analysis based on the correlation coefficient shows that in the years 1991 - 2011 variability of shares of Exxon Mobil Corporation was in 88.6% due to the changes in oil price. This means that only 11.4% of the variability in value of shares was due to other factors, including changes of organizational nature, affecting the value of the company. This study shows that the company's value assessment conducted by investors (based mainly on the analysis of the ability to generate profit) market price of raw material, is highly significant.

The real impact of the implementation of the Balanced Scorecard in Mobil USM&R on the market value of Exxon Mobil Corporation can be assessed only in the years 2000 - 2010, after the merger of Exxon Mobil Corporation. Analysis of the degree of correlation of the company's market value and oil prices on the U.S. market during analyzed period show that the market value depended in 85.6% on changes of oil price, which means that in the market assessment, only 14.4% of the company's value changes could have been caused by other factors.

6. Conclusion

Considering multiplicity of factors being taken into account by investors in the process of determination of the value of company, when in the long term direct impact of oil price on the market price is visible and having described the circumstances of a transformation of the capital, finding a significant impact of implementation of Balanced Scorecard in one of the largest profit-generating division of the biggest oil company which is Mobil USM&R on value of entire company, is not possible with using commonly available data.

Given the results of the short-term based analysis of the level of generated profit in Mobil USM&R, values of EPS, PI and ROA in the Mobil Corporation and the long-term analysis of the value of the Exxon Mobil Corporation, it is not possible to conclude that the implementation of Balanced Scorecard in the Mobil USM&R significantly influenced the effectiveness of division and the value of company. Significant changes in performance and consequently in the value of the company were revealed only during compilation and the first years of use of Balanced Scorecard. After that period results generated by the whole company returned to average levels, compared with the sector.

Literature:

1. Davies, S., Albright, T., *An investigation of the effect of Balanced Scorecard implementation on financial performance*, *Management Accounting Research*, 15(2), 2004, pp. 135-153.
2. Gausser De, F., Mooraj, S., Oyon, D., *Does the Balanced Scorecard Add Value? Empirical Evidence on its Effect on*

Performance, *European Accounting Review*, Vol. 18, No. 1, 2009, pp. 93-122.

3. Kaplan, R., Norton, D., *Putting the Balanced Scorecard to Work*, *Harvard Business Review*, Sept/Oct, 1993, pp. 134-147.

4. Kaplan, R., Norton, D., *Mobil USM&R Linking The Balanced Scorecard*, *Harvard Business School Cases*; Sep, 1996, pp. 1-19.

5. Kaplan, R., Norton, D., *Having trouble with Your Strategy? Then Map It*, *Harvard Business Review*, Sep/Oct 2000, pp. 167-176.

6. Kaplan, R., Norton, D., *Strategy Focused Organization, How Balanced Scorecard Companies Thrive in The New Business Environment*, *Harvard Business School Press*, 2001.

7. Kaplan, R., Norton, D., *Strategiczna karta wyników, jak przelożyć strategię na działanie*, PWN, Warszawa 2002.

8. Kaplan, R., Norton, D., *The Balanced Scorecard: Measures That Drive Performance*, *Harvard Business Review*, Jul/Aug, 2005, pp. 172-180.

9. Kaplan, R., Norton, D., *Using Balanced Scorecard as Strategic Management System*, *Harvard Business Review*, Jul/Aug, 2007, pp. 150-161.

10. Kaplan, R., Norton, D., Rugelsjoen, B., *Managing Alliances with the Balanced Scorecard*, *Harvard Business Review*, No. 1, 2010, pp. 114-120.

11. Mahedy, J.P., Kak, Y., Miller, C., *Black Book - Mobil: Will Pegazus Rise to New Heights*, Preceding, 1998.

12. Norreklit, H., *The Balanced Scorecard: what is the score? A rhetorical analysis of the Balanced Scorecard*, *Accounting, Organizations and Society*, No. 28(6), 2003, pp. 591-619.

13. Oteley, D., *Performance management: a framework for management control systems research*, *Management Accounting Research*, No. 10(4), 1999, p. 363-382.

14. Rigby, D., *Executive Guide - Management Tools 2007*, *Bain & Company Publishing*, 2007.

15. Rigby, D., *Management Tools 2011 An Executive's Guide*, *Bain & Company Publishing*, 2011.

16. Szychta, A., *Etapy ewolucji i kierunki integracji rachunkowości zarządczej*, *Wydawnictwo Uniwersytetu Łódzkiego*, Łódź 2007.

Primary Paper Section: A

Secondary Paper Section: AE, AH

FROM THE BOARD TO E-LEARNING

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The paper was written within the framework of the no P407/11/1306 project entitled „Evaluation of study materials designed for distance education and learning“, supported by GAČR.

Abstract: The use of information and communication technologies in education at all types of schools is becoming commonplace today. Some modern forms of study in the Czech and foreign schools are even based on using information and communication technologies. One of the most important of these technologies is e-learning, which has penetrated into the life of almost every high school and not just in our country. However, the way to this form of education was neither simple nor easy. From the historical point of view, it has been implemented in several stages, which above all responded to the technology options available in a given period, often in relation to the philosophical and pedagogical approaches to teaching and learning. The present essay thus describes some of the most important stages in the development of distance learning in the form of e-learning, not only within the context of the Czech Republic.

Keywords: Theory of learning, individualized learning, distance learning, computer technology, information and communication technologies, e-learning.

1 Introduction

The terms of distance learning or distance learning implemented through the electronically supported learning (often referred to in the abbreviated term of e-learning) are frequently used at present. Although in our country, they are primarily associated with the implementation of education and training within the tertiary education system, with an overlap into lifelong learning, there have recently been efforts to extend this method of education, especially in relation to the use of e-learning, at lower educational stages. These efforts stem from the constructivist paradigm of education, based on the assumption of every learning process being highly individual and all knowledge being made up of one's own experience and interpretation of the world. Consequently, the role of the teacher and the pupil have been changing in a radical way which should result in a change of conditions under which and means through which education is implemented.

As one of possible means to meet the goals of the constructivist theory of learning, e-learning, as a relatively new and progressive form of education, has recently come to the fore in philosophy, education and didactics circles. In terms of the application of the pedagogical-psychological approaches to learning, using computers and computer networks, e-learning has gradually reflected three learning theories, all of them having had and still having a major impact on the design of educational content implemented through distance learning: The theories are as follows:

- Behaviorism (neobehaviorism). Study materials stemming from this psychological theory always await the student's reaction. They are based on pre-specified structures and incentives or tasks, submitted to the learning subject and followed by the diagnosis of the quality of the student's response or behavior, the consolidation of convenient responses and the reduction of the inaccurate ones (1).
- Cognitive psychology. This theory, based on the premise of human behavior modification being determined by internal factors, above all by 'knowledge', puts emphasis on knowledge of both declarative (i. e. sets of particular knowledge) and process (procedures used when acquiring and processing knowledge) character (2). In terms of distance learning, materials containing a wide range of incentives, aimed at achieving cognitive educational goals, using a wide range of information sources, are accented.
- Constructivism. Learning is regarded as a process of students' constructing knowledge individually, i. e. without any pre-set regulations, on the grounds of their previous

experience and through a highly active search for the information and ideas needed in a 'wide open information space' (using so called open technologies), with no restrictions as regards original solutions (3). In terms of distance learning, the application of this theory is conditioned by the creation of learning environments rich in incentives and of activating character, which would meet the demands of both individual and group form of study and are often referred to as "hypermedia learning environments" (4).

All the above mentioned learning theories have influenced the development of distance learning from the individualized to distance form and up to e-learning and its current form of m-learning, e-twinning, etc. Apart from the hereinabove learning theories, the distant forms of education have been considerably influenced by the constantly developing technologies, which, being a major stimulus, provided the process of development of the distant forms of education with a powerful impulse. The most important technologies, with a truly revolutionary impact on the development of education, have been information and communication technologies, represented in this area especially by computer technology, computers, the internet, and mobile communication technologies. That is why we will try, in the course of the following text, to define particular stages of the development of distance learning from not only pedagogical, but also technological point of view.

2 Distance learning and its development

The history of the individualized teaching dates back to a very distant past. As early as in 1728 Caleb Phillips, a teacher, published an advertisement in the Boston Gazette which searched for students willing to become subject to the experimental trying of the new method of teaching of the latter, with the educational content being delivered to them once a week (5).

2.1 Development of distance learning abroad

Initially, modern distance education relied on the rapidly developing postal services, which took place in the 19th century. They were first made use of in 1840 by Isaac Pitman, who began to offer shorthand writing courses in the correspondence form (6). The reaction did not wait long and in 1858 the University of London became the very first university type institution to implement distance learning at all educational levels and in the form of an external training program (7). Short after, the United States of America followed. William Rainey Harper, the first president of the University of Chicago, developed the concept of expanding education. When trying to put this idea to practice, he collaborated with other universities, which resulted in the creation of the concept of school correspondence courses in 1982 and was then put into practice at Columbia University (8). As for Australia, the University of Queensland established the Department of Correspondence Studies in the year 1911(9, p. 256).

It was Charles Wedemeyer, based at the University of Wisconsin-Madison, who first began to neglect postal services in favor of other methods as regards the delivery of the educational content. He thus laid the foundations of the distance learning in America. During the years 1964 to 1968, the Carnegie Foundation funded Wedemeyer's project of AIM (Articulated Instructional Media), which made use of the wide possibilities of communication technologies in order to transmit not only the educational content itself, but also mutual communication. As stated by Moore, AIM became popular especially in Great Britain, where the ideas and methods connected to it were applied in 1969, at the establishment of The Open University. Radio and television emissions started to be widely used instead of the post (10). In 1974, these efforts were followed up not only by the Germany FernUniversität in Hagen (11), but truly all over the world, as in that time, several institutions, based on the same

principles, emerged. These institutions often operated under the Open University title (in English or local language), and all these 'open universities' were using distance education methodology as the primary technology for the delivery of the educational content. Some of these institutions have gradually become so-called 'mega-universities', i. e. institutions with more than 100 thousand students (12).

The development of computers and the Internet made the distribution of distance learning even easier and faster, which ultimately led to the creation of so-called 'virtual universities' with the whole process of education being implemented on-line (13). In 1996, Jones International University began to operate. It is considered the first accredited university department offering education fully on-line, not just on the United States territory, but also worldwide (14).

2.2 Development of distance learning in our country

As regards our country, there was no progress in developing distance education until the year 1989, above all due to the fact that prior to this year, there had been a long tradition of so-called 'distance courses', a specific form of studies which allowed employed people to study along their jobs and was thus widely spread in high schools and colleges (15). Distance learning, as a form of study, had been neglected, its ultimate development being related to the activities of the Czech Association of Distance Education at Universities (ČADUV), founded in 1993. This organization, as well as the National Centre for Distance Education, established in 1995, has always put maximum emphasis on the development of one particular form of distance learning, i. e. e-learning, which is characteristic not only in the Czech Republic but also abroad (16).

3 Distance learning development resulting from the computer technologies and ICT development

From its very beginnings, distance learning has emphasized the promotion of the principles of clarity and demonstration (17). It has thus followed the well-known rule saying that 'the more senses I use to perceive, the easier it becomes to learn, to remember, and to understand' (18). According to K. Kohout, it is the multimedia character of distance learning which invites us to look back as far as to Comenius' principle of demonstration teaching and, moreover, to use its updated form. Nevertheless, demonstration should never be confused with attractiveness, its use being determined by its functionality. An excessive and non-functional use of colors and sounds for example may ultimately provoke rather distraction or neglect from and of the educational content itself.

Some elements of demonstration teaching, such as images, diagrams, graphs, or symbols, widely used in everyday life, too, were already made use of by traditional learning supports. However, they being distributed predominantly in printed form, it was only possible to provide the image information in a static way. Thanks to the development of computer technologies and the hypermedia theory, a growing number of multimedia study supports, being characterized by the extension of the structure with various multimedia and interactive elements (e. g. animation, multimedia records, dynamic simulations, sound recordings, etc.) that can only be presented and distributed in the electronic form, have been used. It is this expansion of interactivity and multimedia components which make the real difference and which distinguish electronic study supports designed for e-learning from the study supports intended for the other, earlier forms of distance education.

The whole process of distance education being influenced by the development of technical means can be traced to the above mentioned principle of demonstration, where the real difference can be noticed. With the developing technique, it was actually possible to apply the principle of demonstration in always better forms and events or happenings not visible to the eye could be displayed through enlargements. It was even possible then to display dynamic images, via which not only particular images, but the whole sequences of consecutive images, i. e. a cine film, a video, etc., could be displayed. Last but not least, auditory

devices, being introduced into the education process after the year 1940, were upgraded, especially in terms of the recording as well as the reproduction equipment

At the same time, a purposeful examination of the impact of audiovisual resources, having stemmed from a joint application of both visual and sound information on the educational process (19), began. The communication theory incorporation into the educational process made it possible to create a comprehensive system of didactic technology, through which learning could finally be implemented as a process of communication. Its basic constituents were as follow, i. e. the source of information containing the curriculum itself (i. e. teaching aids), the transmitter of information (teacher and teaching techniques), information channels (sight, hearing, touch, smell, taste) and the receiver of information being equipped with the just acquired knowledge (pupils, students) (20, p. 26).

As shown in Figure 1, computer technology made its way to the field of audiovisual communication only after the year 1960, when the principles of cybernetics started to be implemented. Until then, computers, had not allowed for extensive use of any kind in the educational process, them being rather ponderous, single purpose devices, highly demanding in terms of operation and maintenance. A major breakthrough came in 1983 when IBM introduced the first personal computer, which enabled a massive use of computers not only by households or businesses, but also at schools. Computer technology thus became affordable and easy to use, a number of software companies, involved in developing application software for professional, as well as user applications, arose. Moreover, in 1984, first computer-aided educational programs, as well as didactic games were launched, which led to the ultimate decrease in interest in the one-purpose teaching machines in favor of computers.

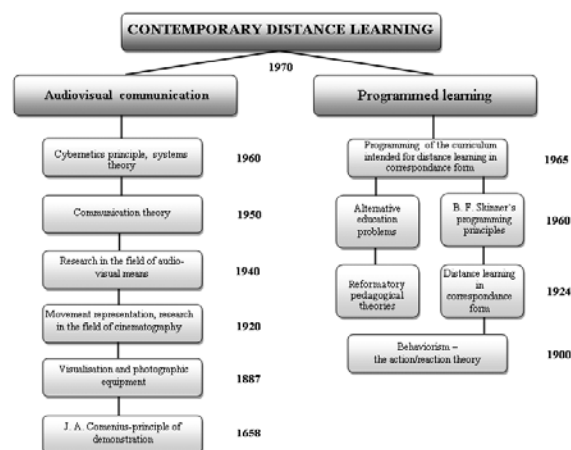


Figure 1 – Relation between audiovisual devices and distance learning in a historical context.

With the further development of computer technology, computer devices became cheaper, which resulted in a rather massive involvement of the latter in practice. Over the last 20 years, computers have become tools enabling the application of the distance learning theory in educational practice. The computer, as a new information transfer medium, facilitates innovation of the 'classical' theory not only of programmed learning but also of distance education and of their application in practice. It makes it possible to use multimedia elements such as animations, sounds and movies, even individually, as stated by John Nightingale (21, p. 45). This means that each student can actually work on his or her own and choose their own pace of work. It also enables providing feedback and consistent control of students' independent work (22, p. 76).

4 E-learning and its development

Though relatively new, having first been used in 1993 (23, p. 25), the history of the concept of e-learning has always been connected with the history of information and communication technologies. The latter do not now influence the very

philosophy and principles of the education process, however, it is due to them that e-learning, as an up-to-date and currently favored method of distance education, made its way through. Its use is nevertheless preconditioned by the meeting of certain technical requirements, which can be divided into two groups. First, it is necessary to create and distribute appropriate educational materials, i.e. electronic study supports, which vitally depend on a mass expansion of the appropriate information technology. It is also essential to provide potential learners with fully electronic 'learning' environments in the form of LMS systems, and supporting tools relating hereto. It is from this purely technical point of view, that we can briefly describe the history of technical and computer equipment, which now allows to implement e-learning.

The history of distance education through e-learning dates back to the late sixties. In that time, new learning machines (24) were experimentally introduced within the framework of the program learning methods development. Even in the former Czechoslovakia we had one of these, then called automatic teaching machines, Unitutor (25), said by some to have been one of the best of its kind in the world in that period. Unitutor not only segmented curricula into individual pages, but also provided the learners with control, multi-choice tasks at the end of every page. Following the answer, the program could be further branched, and the information concerning the correct or incorrect solution presented an immediate feedback. This period is linked with the name of Prof. Milos Lánský in our country. Nevertheless, as a whole, teaching machines were too complicated and not very effective and that is why they did not make their way through.

In the early eighties, eight-bit and sixteen-bit microcomputers emerged, resulting from the so called 'computerization' of education. This massive trend, aimed at providing children with computer literacy, came to our country at the beginning of the year 1985. Specific school microcomputers IQ 151 were launched and teachers were quite interested in them, despite several deficiencies. In the second half of the eighties, first thirty-two-bit computers appeared, the market being then dominated by personal computers PC, built on the IBM platform (26, p. 54). Along with this happening, software industry was developing, too, especially in terms of a massive boom in office applications. Computers finally made their way to households. As regards the education sphere, the global development of cybernetics and artificial intelligence reflected itself in the improvement of the teaching machines, the computer having been introduced to the teaching process in the nature of a teaching as well as examining machine (27, p. 9). Due to this, theories, according to which the computer should have been partially replaced the teacher one day, were starting to be taken into consideration.

In that time, several, mainly university research teams all over the world, began to develop intelligent learning systems, i. e. ITS or Intelligent Tutoring Systems (28), aimed at a creation of applications capable of providing a long-term control over the learning process. The latter combined the ability of interpreting, practicing as well as testing the subject matter, used graphics, animations, sound, and were even able to integrate fully independent programs.

The predominantly testing-aimed use of computers being often subject to criticism, the programmed learning through teaching applications was enriched with elements of artificial intelligence. The tests were enhanced by explanation and practice of the subject matter, subsequently forming a platform for drawing particular lessons and whole courses, too. The advancement of every single student was taken into account, which, nevertheless brought about the responsibility of the computer for predicting students' possible reactions and situations that students might have got involved in. In the early nineties, e-mail appeared as a very fast and promising means of distance communication. This meant a radical shift, because from then on, it has suddenly been possible to carry out a written communication, even a large-scale one, at almost any time.

Along with the development of e-mail, a rapid growth of the worldwide information network, i. e. the Internet, took place. (26, p. 9). Another important step forward as regards technologies was the launch of digital off-line carriers, such as

CD and DVD-ROM, which made it possible to store large volumes of data on relatively small and at the same time portable media. Call conferencing, voice mail and intercontinental connections via satellite changed the traditional ways of communication once and forever.

Tertiary education was among the first to begin discovering the benefits of these newly emerged media and technologies. By the mid-nineties, the university type e-mail communication systems were already established as a norm, especially in traditionally technologically advanced countries like Japan or the USA. Both faculties as well as individual students began using the Internet and the World Wide Web (WWW or Web) services as a source of information, communication and entertainment. Mostly younger students created discussion groups and online chat rooms, which provided them with a possibility to communicate in real time about everything from fashion through politics to finding new friends. The development at universities did not fall behind either. Syllabi, library resources, the contents of lectures started being moved from conventional classrooms to multimedia resources and to the local network. Private companies started looking for possibilities of commercial use of e-learning (29). On the Web itself, virtual universities were created, which offered all of their courses and a possibility of obtaining certificates via the Internet.

The mutual development of facilities, communication technologies, and pedagogical theories applied in practice allowed the establishment of a qualitatively far more efficient, fully electronic 'learning environment', in compliance with the theoretical vision of 'a computerized environment for learning and gathering knowledge' (30), defined by C. Beyou as early as 1982. Since then, the vision has been specified and put in concrete terms in the nature of e-learning and LMS systems allowing for its implementation.

Over the particular stages of the development of e-learning methods the latter have always significantly reflected the technical level of information and communication technologies (them being first off-line, later on-line), and also the level of knowledge in the field of human learning (programs first, then hypertexts and compact multimedia).

5 Conclusion

In the original and what is now seen as outmoded concept of programmed learning theory, which laid foundations to some of the principles of distance learning, computers and information and communication technologies were seen as means stemming from the tradition of teaching machines, which themselves presented the essential means for the implementation of programmed learning. However, the single-purpose teaching machines were soon outmatched by the computer and the information and communication technologies in terms of technique, organization, as well as didactics. Previously, students first had had to learn how to operate the teaching machine itself, learning itself came only afterwards and within each training method, several teaching machines had to be made use of simultaneously. Computers do not work this way. With computers, work with individual teaching materials (or, as regards programmed learning – programs, for distance learning - electronic learning supports), is rather analogous. It is mainly due to the fact that modern programming languages and environments, which are made use of when designing teaching materials, allow for creating user-friendly environments. Those resemble each other (31, s.114) and make it possible for the students to operate them in a rather intuitive way.

Therefore, the computer is to be approached as an element of audiovisual teaching techniques, but providing the user with more options than it is the case with classical, modern as they can be, didactic means, used within the framework of the distance education, implemented through e-learning (32). It makes it possible for the classes to take place at any place and any time, exactly according to the principles of distance learning. The function of the teacher is thus taken over by the computer, i. e. the educational materials or control and communication components of the LMS system, although it is clear that functions and activities associated with the development of social and communication skills of students cannot be carried

out without sophisticated and targeted support of communication by the computer solely.

The use of computers in distance education, implemented through e-learning, must also correspond with the structure of the curriculum, which is thus presented. This means that in particular subjects the computer, via particular study support or general computer program, provides the students with teaching particular content structures. The focus is thus put on the learning process, supported by the computer equipped with communications abilities, as a teaching tool or as a means of communication. Learning is a mental activity, however, and there are many theories that describe and explain it, them being based on psychological principles and phenomena. The combination of all these trends within the framework of information and communication technologies is now called ALE - Adaptive Learning Environments (33). It is a learning environment susceptible to adaptation by the student and interconnecting the research in the field of computers with the research aimed at the teaching process. It also includes humanizing tendencies towards the education as it makes use of the technical system as well as social group activities of particular students.

As it follows from the above said, distance learning, as well as other forms and methods of education, has undergone significant development. As regards distance learning, both classical and e-learning type, development, it has been stimulated by two factors. In Table 1, these two are presented simultaneously, which may help the reader of the paper presented better distinguish between particular learning theories on the one hand and distance education implemented through e-learning on the other hand.

Psychology trend	Behaviorism	Cognitive psychology	Constructivism
Learning theory	Programmed learning	Cognitive theory	Constructive learning
Learning process principle	Stimulus (S-stimulus) – Reaction (R-reaction) – Reinforcement (RF-reinforcement).	Structuring and classing information. Cognitive, psychomotor, and attitude domain.	Learning via setting up and updating formulae (through assimilation and accommodation).
Methods	Setting goals, question, problem, active response, gradual progression, iteration aimed at receiving the correct answer, drilling, practising, associations, chaining, generalising,	Setting goals, explanation, demonstration, illustration, classification, structuring, organizing, examples, algorithm problem solution, analogy, analysis, synthesis, application,	Modelling, simulations, heuristic solutions, object learning, situation learning, authentic learning, contextualization, hypertexts, branching, social approaches, exploration, research,
Distance learning	Correspondence form	Multimedia	Hypermedia
Presentation, communication and management styles	Distance learning implemented in the correspondence form, by sending letters, making phone calls or using fax.	Distance learning based on the use of several different types of transfer media (mass media), radio, TV, computer programs, multimedia audio and visual recordings, CD, and DVD.	Distance learning implemented through e-learning, fully computerized. Computer or computing system projected into every single activity of the tutor as well as the student.
Predominant study materials	Printed, based on the linear character of the text, only still image information used.	Printed, based on the principle of branching, enriched with various media carrying the education content which itself is based on the use of electronic media and computer technologies.	Electronic, based on the principle of hypertext, integrated into a fully digitalized learning environment, in the form of a sophisticated LMS system.

Table 1– Comparison of particular theories in respect of distance learning through its development.

Literature:

- HUNT, M. *Dějiny psychologie*. 1. vyd., Praha: Portál, 2000. 712 s. ISBN 80-7178-386-2. (přeložila R. Mlíková).
- PLHÁKOVÁ, A. *Dějiny psychologie*. 1. vyd., Praha: Grada, 2006. 328 s. ISBN 80-247-0871-X.
- PIAGET, J. *Psychologie inteligence*. 2. vyd., Praha: Portál, 1999. 164 s. ISBN 80-7178-309-9.
- PETTY, G. *Moderní vyučování*. 1. vyd., Praha: Portál, 1996. ISBN 80-7178-070-7.
- HOLMBERG, B. The evolution, principles and practices of distance education. In: *Studien und Berichte der Arbeitsstelle Fernstudienforschung der Carl von Ossietzky Universität Oldenburg* [ASF]. 11. Bibliotheks-und Informationssystem der Universität Oldenburg, 1993. 132 s. ISBN 38-1420-933-8.
- MOORE, M., KEARSLEY, G. *Distance Education: A Systems View*. 2st. ed., Belmont: CA Wadsworth, 2005. 312 s. ISBN 0-534-50688-7.
- Key Facts* [online]. University of London External Programme Website, 12. února 2010. [vid. 12. září 2010]. Dostupné z: http://www.londoninternational.ac.uk/about_us/facts.shtml.
- LEVINSON, D. *Community colleges: a reference handbook*. 1st. ed., ABC-CLIO, 2005. 69 s. ISBN 157-607-766-7.
- WHITE, M. Distance education in Australian higher education — a history. In: *Distance Education 3*, 1982. s. 255-278.
- CLARK, C. Comparing Computer Usage by Students in Education Programs to Technology Education Majors. In: *Journal of Technology Education* [online], 13, 2001, č. 1, s. 5–19. ISSN 1045-1064. Dostupné z: <http://scholar.lib.vt.edu/ejournals/JTE/v13n1/>.
- Three Decades* [online]. United Kingdom, FernUniversität in Hagen. 23. června 2009. [vid. 12. září 2010]. Dostupné z: <http://www.fernuni-hagen.de/english/profile/3decades/learning.shtml>.
- DANIEL, J. *Mega-Universities and Knowledge Media: Technology Strategies for Higher Education*. 1st. ed., Routledge, 1998. 48 s. ISBN 074-9426-34-9.
- GOLD, L., MAITLAND, CH. What's the difference? In: *A review of contemporary research on the effectiveness of distance learning in higher education* [online]. Washington DC: Institute for Higher Education Policy, 1999. [vid. 13. září 2010]. Dostupné z: <http://books.google.com/books?ei=ldA7TcruEZG38gODpYyKcA>.
- Accreditation* [online]. United states of america: Jones International University. 4. března 2010. [vid. 14. září 2010]. Dostupné z: <http://www.international.edu/about/history/accreditation>.
- PALÁN, Z., LANGER, T. *Základy andragogiky*. 1. vyd., Praha: Univerzita Jana Amose Komenského, 2008. 184 s. ISBN: 978-80-86723-58-7.
- PRŮCHA, J. *Pedagogická encyklopedie*. 1. vyd., Praha: Portál, 2009. 936 s. ISBN 978-80-7367-546-2.
- LOJDA, J., REITTER, L. *Úvod do problematiky distančního vzdělávání* [online]. Brno: centrum distančního vzdělávání, 1996. [vid. 17. srpna 2010]. Dostupné z: <http://www.iba.muni.cz/esf/res/file/bimat2009/distanzni-vzdelavani.pdf>.
- KOHOUT, K. *Klady a problémy současného distančního vzdělávání a e-learningu* [online]. Brno, 2006. [vid. 17. srpna 2010]. Dostupné z: www.e-univerzita.cz/old/2006/doc/Karel_Kohout-referat.doc.
- NIKL, J. *Didaktické aspekty technických výukových prostředků*. 1. vyd., Liberec: Technická univerzita, 2002. 63 s. ISBN 80-7083-635-0.
- BOHONY, P. *Didaktická technológia*. 1. vyd. Nitra, Pedagogická fakulta UKF: Vydavateľství Michala Vaška v Prešově, 2003. 176 s.
- SLAVÍK, J. *Počítač jako pomocník učitele*. 1. vyd., Praha: Portál, 1997. 119 s. ISBN 80-7178-149-5.
- NEZVALOVÁ, D. *Pedagogika pro učitele – Kapitoly z obecné didaktiky*. 1. vyd., Olomouc: Vydavatelství Univerzity Palackého, 1995. 104 s. ISBN 80-7067-490-3.

23. DVOŘÁKOVÁ, M., KLISZ, M., NEUMEISTER, P., 1. OPELATLOVÁ, A., STUPKOVÁ, V., TECHLOVÁ, P. *Problematika finančních a jiných zdrojů nejen v sociální sféře*. 1. vyd., Olomouc: HANEX, 2008. 86 s. ISBN 978-80-7409-017-2.
24. STRÍTESKÁ, H. *Historie e-learningu v České republice* [online]. 10. ledna 2007. [vid. 3. ledna 2011]. Dostupné z: <http://www.fi.muni.cz/usr/jkucera/pv109/2003p/xstrites.htm>.
25. BRDIČKA, B. *Hypertextová učebnice určená učitelům, studentům učitelských oborů, ale též všem, kdo chtějí používat počítač jako učební pomůcku* [online]. 24. července 1995. [vid. 3. ledna 2011]. Dostupné z: <http://it.pedf.cuni.cz/~bobr/ucspoc/vyukprg.htm>.
26. KLEMENT, M. *Výpočetní technika – software a hardware*. 1. vyd., Olomouc: Vydavatelství UP Olomouc, 2002. 178 s. ISBN 80-244-4012-6.
27. KLEMENT, M. *Základy práce s PC*. 1. vyd., Olomouc: Vydavatelství UP Olomouc, 2001. 215 s. ISBN 80-244-0317-X.
28. BURTON, R., BROWN, S. An investigation of computer coaching for informatik learning activities. In: *D. Sleeman and J. Brown (Eds.) Intelligent tutoring systems*. 1st. ed., New York: Academic Press, 1992. 158 s..
29. STRÍTESKÁ, H. *Historie e-learningu v České republice* [online]. 10. ledna 2007. [vid. 3. ledna 2011]. Dostupné z: <http://www.fi.muni.cz/usr/jkucera/pv109/2003p/xstrites.htm>.
30. BEYOU, C. Vers un systeme d'enseignement du dépannage intégrant des connaissances évolutives. In: *Communication au 7e symposium canadien sur les technologies pédagogiques*, Montréal, mai. 1992.
31. KLEMENT, M. Specifika tvorby výukových programů v programovacím jazyce Microsoft® Visual Basic. In: *Modernizace výuky v technicky orientovaných oborech a předmětech. Pedagogická fakulta UP, Olomouc, 29. a 30. června 1999. s. 112-115*. ISBN 80-7478-782-6.
32. JANDOVÁ, L. *Počítačová výuka a její uplatnění ve škole*. 1. vyd., Plzeň: Vydavatelství Západočeské univerzity, 1996. 75 s. ISBN 80-7015-182-1.
33. BAILEY, C., FILL, K., ZALFAN, M., DAVIS, C. Panning for Gold: Designing Pedagogically-inspired Learning Nuggets. In: *IEEE Journal of Educational Technology and Society – Special Issue, Theme: Learning Design* [online]. 9 (1), 2006. s. 113-122. [vid. 23. srpna 2010]. Dostupné z: <http://eprints.ecs.soton.ac.uk/11939/1/10.pdf>.

Primary Paper Section: A

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QUALITATIVE RISK ANALYSIS AS A STAGE OF RISK MANAGEMENT IN INVESTMENT PROJECTS: ADVANTAGES AND DISADVANTAGES OF SELECTED METHODS – THEORETICAL APPROACH

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Abstract: The qualitative risk analysis is an integral part of a risk management process in investment projects. In business practice the analysis should be combined with the quantitative approach. Only this combination can ensure that risks, which occur in an investment project are viewed comprehensively. People responsible for risk management must be able to use both qualitative and quantitative methods. They also need to know the advantages and disadvantages of these methods as their scope of applications may differ, depending on a project type. These problems are addressed by the paper, which aims to discuss the qualitative risk analysis in investment projects, with the focus on the strengths and weaknesses of specific methods and the differences between them. The paper outlines the most important issues in this area.

Keywords: risk, risk management, qualitative risk analysis, qualitative methods

1 Introduction

To perform a comprehensive assessment of investment project risks in business practice, both quantitative and qualitative methods should be employed. The knowledge of methodology in this area is the prerequisite for accurate risk evaluation, i.e. the combined use of quantitative and qualitative methods ensures more accurate risk estimation. Sometimes better results are rendered by qualitative methods. This is, first of all, due to the type of a specific investment project and the industry in which the project is going to be executed. In general, if quantitative results are supplemented by the qualitative approach, we have a better overview and decision makes are able to manage project risks more effectively. In particular, risk managers should be aware of advantages and disadvantages of quantitative and qualitative methods. The knowledge of their strengths and weaknesses is required to appropriately respond to any business needs in this respect and apply the methods correctly in business activities. This knowledge is also vital for the accuracy of such methods in specific cases and types of projects. These problems are addressed in the paper, which is aimed to discuss the qualitative methods used in investment project risk analyses. In particular, the paper draws attention to advantages and disadvantages of specific methods and shows the basic differences between these methods. The deliberations in the paper are mainly theoretical, and the problems are presented in a synthetic way. It should be noted, however, that the authors also indicate the practical value of some of the methods in question. The authors draw on the knowledge and experience gained from their long-term research into investment risk. In order to ensure accurate presentation of the problems, the literature review and the method of deduction were used.

1.1 Qualitative risk analysis as a stage of risk management in investment projects

Both in theory and in practice, there are various definitions of risk management. The literature tends to define risk management as all the activities connected with risk identification, assessment, selection of appropriate responses and risk monitoring. Within the international risk management standards, there have been developed a general risk management scheme, which comprises a few key stages, namely:

1. establishment of an enterprise's strategic goals, its risk appetite and risk tolerance,
2. risk assessment, including risk identification, risk analysis, risk evaluation,

3. risk treatment¹.

In business practice, however, risk is analysed not only for risk management at the corporate level, but also for a specific project. Therefore, a risk analysis process is made up of three phases, i.e. planning, risk assessment and risk treatment. Risk assessment is of particular importance here. The scientific literature summarises it by means of the following quotation: risk assessment = risk analysis + risk evaluation². The key aim of risk analysis is to identify the specific risk levels by establishing the relationship between the likelihood of a given event and consequences of its occurrence³.

The flow of the risk analysis process is presented graphically in Fig. 1.

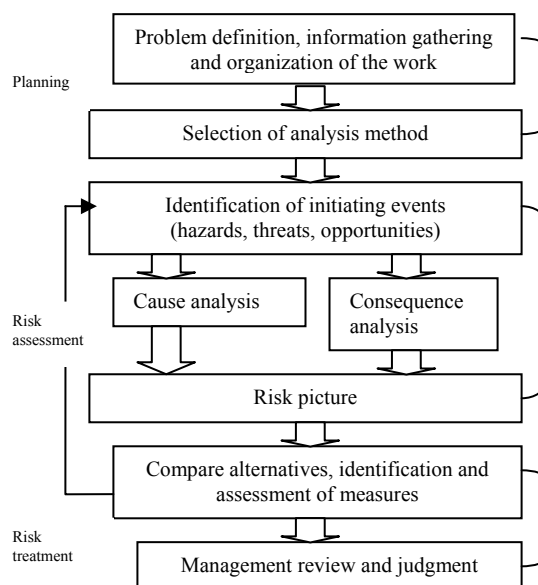


Fig. 1. The main steps of the risk analysis process

Source: Avent, T., Risk analysis. Assessing..., op. cit., 9 p.

In business practice, a highly significant stage within the risk analysis is the selection of an analysis method, i.e. when we choose a method, which allows us to analyse the predefined risk. The main categories of risk analysis methods, which are used by companies, are presented in Tab. 1.

Table 1. Main categories of risk analysis methods

Main category	Type of analysis	Description
Simplified risk analysis	Qualitative	Simplified risk analysis is an informal procedure that establishes the risk picture using brainstorming sessions and group discussions. The risk might be presented on a coarse scale, e.g. low, moderate or large, making no use of formalised risk analysis methods.
Standard risk analysis	Qualitative or quantitative	Standard risk analysis is a more formalised procedure in which recognized risk analysis methods are used, such as HAZOP and coarse risk analysis, to name a few. Risk matrices are often used to present the results.

¹ See: ISO 31000:2009 Risk management-Principles and guidelines, Risk Management Standard AIRMIC/ALARM/IRM 2002, COSO II - Enterprise Risk Management – Integrated Framework 2004.

² Avent, T.: Risk analysis. Assessing uncertainties beyond expected values and probabilities. New Jersey: John Wiley & Sons, Inc., 2008, 8 p.

³ ISO 31000:2009 Risk management-Principles and guidelines: Op. cit., 18 p.

Model-based risk analysis	Primarily quantitative	Model-based risk analysis makes use of techniques such as event tree analysis and fault tree analysis to calculate risk.
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Source: Avent, T.: Risk analysis. Assessing..., op. cit., 4 p.

As emphasized in the introduction, qualitative and quantitative methods are equally useful for an investor in the risk analysis. In addition, in the scientific literature this point is often stressed as well. According to D. Frame „(...) the two approaches address different things. (...) The qualitative approach recognizes that experience coupled with hunches and good judgment enable people to develop insights that they cannot develop if they are constrained by the requirement that they work only with measurable phenomena. (...) This is particularly true with a range of situations, including first-of-a-kind experiences, circumstances where politics reign, and situations where outcomes are determined through negotiations”⁴.

1.2 Selected qualitative methods of risk analysis – their advantages and disadvantages

The main aim of a qualitative risk analysis, carried out for an investment project, is to identify risks with low, moderate or high significance for the given project and prepare information for the subsequent stage of the risk assessment process, i.e. risk evaluation. The value of likelihood and consequences of a specific event are given by description. In business, risks can be divided into high, moderate and low risks. Unlike the quantitative ones, the qualitative methods don't express the size of likelihood or consequences by means of figures. An investor has a variety of quantitative methods to choose from. The risk management standard of *ISO 31000:2009 Risk management-Principles and guidelines* recommends that checklists and questionnaires, SWOT analysis, physical inspections, analysis based on records of the operation, flowcharts or event trees are used for qualitative risk assessment⁵. D. Frame, in turn, gives such qualitative methods as: scenario building, the likelihood-impact matrix, attributes analysis, delphi forecasting⁶. In general, in the entire risk management process, following the identification of risks, which are significant for an investor's objectives, the risks are assessed, which means that the most significant risks, as well as the risks which are less important for the project, are indicated. This can be done by using the methods given below:

- Delphi method: this method uses the knowledge and experience of experts representing various areas, which are relevant to the research. The experts may be an enterprise's staff members but they can also come from outside the company. One of the assumptions underlying this method is the fact that the experts invited to participate in the research don't know who else belongs to the panel and they don't interact with one another. They receive questionnaires containing statements, which are the predictions about the long-term development of a given event. Their task is to choose and indicate the course of the event, which they find most likely. After that, using statistical methods, most frequently the median, average responses are identified. The collective replies are then presented to the experts, who are asked to give their opinions. This stage may be repeated a number of times, so that the experts can achieve consensus⁷. The delphi method belongs to expert methods.

- Brainstorming: this heuristic method was created by A.F. Osborn. It involves, in particular, the assembling of a group of people, who are presented a specific problem that needs to be solved. These people express any ideas of how to solve the problem they are able to come up with and these ideas are written down. At the final stage, a host needs to sum up the ideas by conducting an analysis and evaluating all of them. The basic assumption behind the brainstorming method is the fact that

even the most unrealistic ideas cannot be criticised during the discussion. It should be added that a method, which is similar in usage is the nominal group technique. The key differences between the Delphi method, brainstorming and the nominal group technique are outlined in Tab. 2.

Tab. 2. Differences between nominal group technique, brainstorming and Delphi

Characteristic	Nominal group technique	Brainstor-ming	Delphi
GROUP			
<u>Group size</u>	Member equality	Member dominance	Respondent equality
<ul style="list-style-type: none"> Equality of participation/p articipation inhibited/mem ber dominance Degree of cohesion 	Contribution and participation reduces with an increase in group size affecting cohesion	Cohesion reduces with group size	Sense of belonging, strength of commitment and cohesion reduced by isolation of respondents
<u>Member characteristics</u>	Social needs of members may affect members responses	Social needs of members may affect members responses	
<ul style="list-style-type: none"> Degree of group compatibility Emotional 'blocks' Level of experience/pro fessional training Personality characteristics Company position imbalance/stat us incongruities 	inhibited participation, but likely to be less than brainstorming	inhibited participation	Unaffected
<u>Individual objectives and roles</u>	affected	affected	No reticence to fully participate
<ul style="list-style-type: none"> Potential for task oriented effort to be drained by pursuit of hidden agendas Potential for task oriented effort to be drained by pursuit of social needs Interpersonal behaviour 	inhibited participation	inhibited participation	Uninhibited participation, not self conscious
	self conscious participation but less than brainstorming inhibited participation	self conscious participation inherent pressures	
	affected	affected	Unaffected
	affected	affected	Unaffected
	affected, participation directly encouraged by the sequence of steps in the technique	affected if long meeting participants may be distracted, lose interest	Freedom not to conform
	affected	affected	Unaffected
	may arise	may arise	Unaffected
			Unaffected
<u>Stage of development</u>			Unaffected
<ul style="list-style-type: none"> Informational pressure Normative pressure 			Unaffected
			Unaffected
THE TASK			

⁴ Frame, J.D.: Managing risk in organizations. A guide for managers. Washington: Jossey-Bass, 2003, 69 p.

⁵ Knight, K.W.: ISO 31000:2009. New risk management standard. The materials from a workshop held at the 4th International Conference of Risk Management Association of POLRISK, Warszawa 2010, (slides: of qualitative analysis and examples of quantitative analysis).

⁶ Frame, J.D.: Managing risk..., op. cit., 70 p.

⁷ See: Frame, J.D.: Managing risk..., op. cit., 79-81 pp.

Nature of the Task unclear criteria for effectiveness	Group meetings directly affected by clear explanation of determinates	Group meetings directly affected by clear explanation of determinates	Effectiveness entirely dependent on the content of the questionnaires
Salience of the task	Dependent on clear and persuasive argument at the outset	Dependent on clear and persuasive argument at the outset	
Poor definition of the task	Meeting preparation time required	Meeting preparation time required	Dependent on clear and persuasive argument at the outset
<ul style="list-style-type: none"> Written material needs to be created and/or considered Requires a high level of technical expertise 	Structure required	Minimal preparation	No opportunity for clarification, maximum preparation time
	Discipline skill required	Discipline skill required	Extensive preparation
ENVIRONMENT			
norms and expectations – unstructured method of working leader position-poor morale	Structured	Strong direction required	Highly structured
poor inter-group relations physical location	Strong leader required for group sessions Affected affected	Strong leader required Affected affected	Unaffected Unaffected unaffected

Source: Chapman, R.J.: The effectiveness of working group risk identification and assessment techniques, International Journal of Project Management, Vol. 16, No. 6, 1998, 341 p.

- Scenarios: the scenarios method involves the construction of a number of scenarios, which describe the potential future developments of a company, which carries out the investment project, or its surroundings. These should be best case scenarios, neutral scenarios and worst-case scenarios. They may come in form of descriptive reports, drawings, tables or event trees⁸. The event trees method, for example, comes in form of a graph (in shape of a tree), which presents the most important alternative events, in the chronological order, together with their likelihood.

- Risk rating matrices: this method identifies risks and places them on a coordinate system, where one axis shows the values of likelihood of a risk event and the other axis shows the consequences that the event may cause in a company. By placing every risk separately on the coordinate system we have to specify the size of its likelihood and consequence. We determine the scale for both these values on our own. The simplest scale is a three-degree one in which the values of the likelihood and the consequences are referred to as low, moderate and high. After placing all the examined risks we arrive at a so-called risk rating matrix, which is commonly known as a risk map. In order to make it clearer, the colours of traffic lights, i.e. red, yellow and green, are used. The fields marked in green signify the low likelihood risks but with different consequences or the risks with low consequences but different likelihoods. When constructing the matrix these risks are regarded as least harmful for the enterprise. In business practice, risk matrices are produced all the time so that the risk dynamics can be monitored on a regular basis. The fields marked in yellow, for instance, mean risks with low or high likelihood and moderate or major consequences. The risks, which are located in the red field are critical for the enterprise. These risks should be handled by the investor as priority ones because their likelihood is high and consequences highly significant. A sample matrix is presented in Fig. 2.

Consequence	Likelihood				
	Rare	Unlikely	Possible	Likely	Almost certain
Catastrophic	High	Very high	Very high	Very high	Very high
Significant	High	High	Very high	Very high	Very high
Major	Tolerable	High	High	Very high	Very high
Moderate	Low	Tolerable	Tolerable	High	High
Minor	Low	Low	Tolerable	Tolerable	Tolerable
Insignificant	Very low	Low	Low	Tolerable	Tolerable
Negligible	Very low	Very low	Low	Tolerable	Tolerable

Fig. 2. Risk rating matrix

Source: Knight, K.W.: ISO 31000:2009. New risk management standard. The materials from a workshop held at the 4th International Conference of Risk Management Association of POLRISK, Warszawa 2010, (slides: example of risk rating matrix).

In practical business activities, risk assessment based on a multi-degree scale, as presented in Fig. 2, may pose some difficulty. Therefore, from a practical point of view, more useful scales are three-, four- and five-degree ones. Table 3 lists the pros and cons of these methods, which may be directly used at the stage of the qualitative risk analysis in projects.

Tab. 3. Selected methods and techniques for performing a qualitative risk analysis

Technique	Strengths	Weaknesses	CSFs for Effective Application
Estimating techniques (applied to probability and impacts)	<ul style="list-style-type: none"> Addresses both key dimensions of a risk, namely its degree of uncertainty (expresses as probability) and its effect on project objectives (expressed as impact) 	<ul style="list-style-type: none"> Difficult to calibrate if there is no historical database of similar events Terms for probability (e.g. probable, almost certain) and for impact (e.g. insignificant, major) are ambiguous and subjective Impact can be uncertain or represented by a range of values that cannot be put into a specific impact level such as "moderate impact on time" 	<ul style="list-style-type: none"> Agreed definitions of probability and impacts which reflect stakeholders' risk tolerances and thresholds Values used in the definitions represent the same level of impact across objectives as perceived by the organization's management or project stakeholders Consistent use of these definitions across all identified risks Access to SMEs who have experience with the type of risk
Root-Cause Analysis	<ul style="list-style-type: none"> Allows identification of additional, dependent risks Allows the organisation to identify risks that may be related because of their common root causes Basis for development of pre-emptive and comprehensive responses Can serve to reduce apparent complexity 	<ul style="list-style-type: none"> Most risk management techniques are organised by individual risk. This organisation is not conducive to identifying the root causes Can oversimplify and hide existence of other potential causes There may be no valid strategy available for addressing the root cause once it has been identified 	<ul style="list-style-type: none"> Ability to identify if a risk is an outcome of a more fundamental cause Willingness by management to accept and address the root cause rather than adopting partial workarounds
Post-project reviews/ Lessons learned/Historical Information	<ul style="list-style-type: none"> Leverages previous experience Prevents making the same mistakes or missing the same opportunities twice Enhances the Organisational Process Assets 	<ul style="list-style-type: none"> Limited to those risks that have occurred previously Information is frequently incomplete: details of past risks may not include details of successful resolution; ineffective strategies are rarely documented Creative generation of ideas 	<ul style="list-style-type: none"> Well structured project lessons learned database Participation of previous project team members (ideally including the project manager)

⁸ See more: Korombel, A.: Ryzko w finansowaniu działalności inwestycyjnej metodą project finance, Difin, Warszawa 2007, pp. 106-107.

Probability and Impact Matrix (P-I Matrix)	<ul style="list-style-type: none"> Allows the organisation to prioritise the project risks for further analysis (e.g., quantitative) or risk response Reflects the organisation's level of risk tolerance 	<ul style="list-style-type: none"> Does not explicitly handle other factors such as urgency or manageability that may partly determine a risk's ranking The range of uncertainty in the assessment of a risk's probability or impact may overlap a boundary 	<ul style="list-style-type: none"> P-I matrix requires that the input data are clear and unambiguous in assigning levels of probability and impact Effective estimation of impact and likelihood as outlined previously Organizations should be careful to assess the combinations of probability and impact that qualify a risk as low, moderate or high risk so that the method used reflects the organisation's risk attitude Definitions used to designate the levels of impact (L,M,H) for each objective should represent the same level of impact as perceived by the organization's management or project stakeholders as reflecting the organisation's utility function
Analytic Hierarchy Process	<ul style="list-style-type: none"> Assists in developing a relative weighting for project objectives that reflects the organization's priorities for time, cost, scope and quality for the project Assists the creation of an overall project priority list of risks created from the risks' priority with respect to individual objectives 	<ul style="list-style-type: none"> Organisational decisions are often made by committees, and individuals may not agree on relative priority among objectives Difficult to gather the information about pair-wise comparison of the objectives from high-level management 	<ul style="list-style-type: none"> Expert facilitator in the process Agreement by management that it is useful to develop a consistent set of priorities among objectives Use of proper method or available AHP software

Source: Based on: Practice Standard for Project Risk Management. Project Management Institute, Inc., Newtown Square 2009, 72-76 pp.

The advantages and disadvantages of the specific qualitative analysis methods, which are outlined in Tab. 3 should always be taken into account, when managing investment projects. Since every project is different, a decision on which of the methods should be applied, depending on a situation and specific needs, has to be made on a case-by-case basis. The methods listed in Tab. 3 are just a few examples out of all the methods comprehensively described in the literature on the subject⁹.

2. Conclusion

The qualitative approach to risk management in investment projects requires the knowledge of advantages and disadvantages of specific methods and techniques, which can be used in this area. This concerns, first of all, the risk analysis stage. The knowledge allows decision makers to choose the most appropriate methods, depending on the type of an investment to be carried out, and apply them correctly in business activities. By combining the expertise with the knowledge about the advantages and disadvantages offered by quantitative methods, we should be able to conduct a comprehensive assessment of risks related to a given investment project. Only such a formula may ensure appropriate risk estimation, i.e. accurate and effective risk evaluation. It should be added that a practical qualitative risk analysis may be performed throughout the entire risk management process and, in particular, at the risk identification stage, where the risk management process commences. This stage is vital for further successful risk

evaluation, as any risks and risk factors ignored at this stage may ultimately lead to inaccurate risk estimation. Therefore, many of the qualitative methods outlined in the paper should be used comprehensively at various stages of investment project implementation and risk management. In business practice, it's the outcome, i.e. risks which are accurately estimated using all accessible resources and methods, that counts.

Literature:

1. A Guide to the Project Management Body of Knowledge (PMBOK®) Guide Third Edition. Pennsylvania: Project Management Institute, 2004. 237 p. ISBN 1-930699-45-X.
2. Aven, T.: Risk analysis. Assessing uncertainties beyond expected values and probabilities. New Jersey: John Wiley & Sons Inc., 2008. 4,8,9 pp. ISBN 978-0-470-51736-9.
3. Frame, J.D.: Managing risk in organizations. A guide for managers. Washington: Jossey-Bass, 2003. 69, 70, 79-81 pp. ISBN 0-7879-6518-9.
4. Chapman, R.J.: The effectiveness of working group risk identification and assessment techniques, International Journal of Project Management, Vol. 16, No. 6, 1998, 341 p. ISSN: 02637863.
5. ISO 31000:2009 Risk management-Principles and guidelines.
6. Knight, K.W., ISO 31000:2009. New risk management standard. The materials from a workshop held at the 4th International Conference of Risk Management Association of POLRISK, Warszawa 2010. (slides: qualitative analysis and examples of quantitative analysis).
7. Korombel, A.: Ryzyko w finansowaniu działalności inwestycyjnej metodą project finance. Warszawa: Difin, 2007. 106-107 pp. ISBN 978-83-7251-791-3.
8. Marcinek, K.: Ryzyko projektów inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2001, 157 p. ISBN 8372460035.
9. Marcinek, K., Foltyn-Zarychta, M., Pera, K., Saluga, P., Tworek, P.: Ryzyko w finansowej ocenie projektów inwestycyjnych. Wybrane zagadnienia. Katowice: Uniwersytet Ekonomiczny w Katowicach, 2010. ISBN 9788372466341.
10. Practice Standard for Project Risk Management. Project Management Institute, Inc., Newtown Square 2009, 72-76 pp. ISBN 978-1-933890-38-8.
11. Tworek, P.: Methods of risk identification in companies' investment projects. 5th International Scientific Conference "Managing and Modelling of Financial Risks". VŠB-Technická Univerzita Ostrava, 8th-9th September 2010. 420-424 pp. ISBN 978-80-248-2306-5.
12. Tworek, P.: Ryzyko wykonawców przedsięwzięć inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2010. ISBN 978-83-7246-500-9.
13. Wideman, M.R.: Project & Program Risk Management. A guide to managing project risk & opportunities. Newtown Square: Project Management Institute, 1992. ISBN 1-880410-06-0.

Primary Paper Section: A

Secondary Paper Section: AH, BC

⁹ See more: A Guide to the Project Management Body of Knowledge (PMBOK®) Guide Third Edition. Pennsylvania: Project Management Institute, 2004. 237 p.; Practice Standard for Project Risk..., op. cit.; Marcinek, K.: Ryzyko projektów inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2001; Wideman, M.R.: Project & Program Risk Management. A guide to managing project risk & opportunities. Newtown Square: Project Management Institute, 1992. See also: Marcinek, K., Foltyn-Zarychta, M., Pera, K., Saluga, P., Tworek, P.: Ryzyko w finansowej ocenie projektów inwestycyjnych. Wybrane zagadnienia. Katowice: Uniwersytet Ekonomiczny w Katowicach, 2010; Tworek, P.: Methods of risk identification in companies' investment projects. 5th International Scientific Conference "Managing and Modeling of Financial Risks". VŠB-Technická Univerzita Ostrava, 8th-9th September 2010, 420-424 pp.; Tworek, P.: Ryzyko wykonawców przedsięwzięć inwestycyjnych. Katowice: Akademia Ekonomiczna im. K. Adamieckiego, 2010.

THE PROTECTION (?) OF PERSONAL RIGHTS IN EMPLOYMENT RELATIONSHIPS

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Abstract: The article takes a critical view on changes which were caused by the latest amendment to Slovak Labor Code in the area of personal rights in employment relationships. It analyses selected questions of its protection and refers on disproportions which arose between obligations and rights of employers and employees. This disproportion between obligations and rights has a negative impact on certainty of participant relationship that has weaker position. Disproportion has negative influence on reduction of degree of protective function of labor law. Therefore the changes which were brought by the amendment to Slovak Labor Code do not mean stronger protection of personal rights in labor law.

Keywords: *Personal rights, employment relationships, mobbing, discrimination, personal data protection.*

Introduction

The amendment to the Slovak Labor Code (Act No. 311/2001) which was made by the Act No. 257/2011 takes into force in 1 September 2011. Changes which were caused with this act have intervened in the area of employee's personal rights and their protection. Personal rights or personality of individual is an institute of civil law. But nature of personal rights, especially their inalienability, causes that they stay in every legal relationship where natural person takes part like subject. In employment relationships there is a relation between employer and employee. Only natural person may be an employee. The legal regulation of employee's personal rights is in labor law regulated not only in Slovak Labor Code, but in other labor relations acts too. Employees perceive realization of their personal rights in connection with labor institutes, among realization of their social rights and sometimes we can speak about their mutual interpenetration. In this article we shall try to analyze changes and their impact on qualitative aspect of protection of employee's personal rights in the case of elimination of mobbing at workplace and personal data protection in pre-contractual relationships.

1 COMPLAINT FOR MOBBING AT WORKPLACE

The word "mobbing" is a very frequent word. It indicates behavior of individual or group at workplace which is undesirable and which makes hostile surroundings for person which is an object of this behavior¹. It has a negative impact on personality of individual and abases its human dignity² and honor at workplace or society. It can be a cause of great variety of medical disabilities which may influence the absence at work³.

Mobbing comprises from several undesirable behaviors. Slovak Labor Code has not legal definition of mobbing. This situation is not same if we speak about behaviors which make the contest of mobbing. Discrimination is one of the undesirable behavior

which is very frequent in employment relationship⁴. Discrimination is a subject of legal regulation not only in Slovak Labor Code but there is a special act which describes discrimination behaviors. We speak about Anti-discrimination Act No. 365/2004 (the next "Anti-discrimination Act"). If person was the object of this behavior he/she may use a complaint. The addressee of this complaint is employer. Furthermore object of the discrimination may sue the employer for this behavior. These instruments of legal protection are regulated in provision § 13 section 4 and 5 of the Slovak Labor Code. Filing an action is not independent on filing a complaint. Object of the discrimination can use one of them or either in the same time.

The provision of § 13 of Slovak Labor Code regulates situations when one subject of employment relationship acts in contradiction of morality, abuses rights or duties from employment relationship and if there is a victimization. These three described situations are kinds of mobbing behavior. Legislator tries to eliminate these undesirable behaviors and determines restriction for them. This restriction is contested in provision § 13 section 3 of Slovak Labor Code.

While we analyze the provision § 13 of Slovak Labor Code, we can contend that it is a provision which regulates several behaviors of mobbing. We can find there discrimination, acting in contradiction of morality⁵, abusing of rights and duties from employment relationships and victimization. Legislator tries to eliminate these behaviors and sets up the obligation for employer. This obligation contents the order that employer must solve this problems at workplace. Moreover provision § 13 of Slovak Labor Code regulates instruments of legal protection too. Before the latest amendment to Slovak Labor Code the object of behaviors selected in provision § 13 of Slovak Labor Code may sue his/her employer. This instrument of legal protection is regulated in provision § 13 section 5 of Slovak Labor Code. It can be used if there is discrimination likewise situations described in provision § 13 section 3 of Slovak Labor Code. In these cases legislator eliminates the manners of legal protection. The object may only use manners which are contested in Anti-discrimination Act. In accordance of provision § 9 section 2 of Anti-discrimination Act object may request forbearing from mobbing, removing the consequences and request appropriate moral satisfaction. If moral satisfaction is not sufficiency object may request in accordance of provision § 9 section 3 of Anti-discrimination Act a financial satisfaction likewise damages according special legal statutes⁶. This elimination means that behaviors indicated in provision § 13 section 3 of Slovak Labor Code are considered for kinds of discrimination and that whole provision § 13 of Slovak Labor Code deals with discrimination in employment relationships.

The next instrument of legal protection against mobbing is institute of complaint. Before adoption of the latest amendment to Slovak Labor Code was this institute used only if there was acting which is regulated in provision § 13 section 1 and 2 of Slovak Labor Code. Section 1 regulates situations when employer must observe the principle of equal treatment in employment relationships in accordance with special legal act. This special legal act is Anti-discrimination Act. Anti-discrimination Act sets up in provision § 2 section 1 that respect of this principle is realized through principle of non-discrimination from reasons which are enshrined there. Section 2

¹ The first definition of this behavior makes H. Leymann. See: LEYMAN, H.: *The Mobbing Encyclopaedia. Bullying, Whistleblowing. The Definition of Mobbing at Workplace*. Available on: <http://www.leymann.se/English/12100E.HTM>.

² Human dignity like a fundamental goodness of society is a subject of research in research activities for example M. Barinková and J. Trojan. See: BARINKOVÁ, M. – TROJAN, J.: *Etické aspekty zabezpečenia a ochrany dôstojnosti zamestnanca*. In: BARANCOVÁ, H. (ed.): *Pracovné právo 21. storočia*. Plzeň: Aleš Čenek, 2009, p. 172 and the following.

³ European agency for safety and health at work highlight that there is a threat between mobbing and health at work. See. European agency for safety and health at work: *Mobbing at work*. In: Facts 23. Bilbao: European agency for safety and health at work, 2003, p. 1.

⁴ The subjects of this behaviour are special categories of employees too (women, pregnant women, mothers, youthful workers). See: ŽOFČINOVÁ, V.: *Limity ochrany práv osobitných kategórií zamestnancov (žien, tehotných žien, matiek, mladistvých) v kontexte medzinárodného pracovného práva*. In: *Dny verejného práva, zborník príspevků z mezinárodní konference*. Brno: Masarykova univerzita v Brně, 2007, p. 1265-1273.

⁵ About morality see article: JANIČOVÁ, E.: *Kolektívna zmluva – lex contractus realizácie sociálneho dialógu a zodpovedného podnikania*. In: BARINKOVÁ, M. (ed.): *Európska dimenzia podnikovej sociálnej zodpovednosti a jej vplyv na reguláciu pracovnoprávných vzťahov, zborník príspevkov účastníkov vedeckého sympózia s medzinárodnou účasťou*. Košice: Univerzita P. J. Šafárika v Košiciach, 2009, p. 191 – 193.

⁶ For example provision § 420 and following of Civil Code (Act No. 40/1964).

of provision § 13 of Slovak Labor Code prohibits discrimination from reasons which are contested in this provision. If we compare provision § 2 section 1 of Anti-discrimination Act with provision § 13 section 2 of Slovak Labor Code we can state that Slovak Labor Code sets up wider circle of discrimination reasons. What is the same is that Anti-discrimination Act and Slovak Labor Code do not close circle of discrimination reasons.

As we mentioned, using of institute of complaint was eliminated only on situations which are regulated in provision § 13 section 1 and 2 of Slovak Labor Code, but option to sue employer which is contested in provision § 13 section 5 of Slovak Labor Code, is enshrined for behaviors set up in provision § 13 section 3 too. We must remind that provision § 13 section 5 of Labor Code every behaviors considers for kind of discrimination, but it is not same at complaint. This access did not change after the latest amendment to Slovak Labor Code, but changes expanded the situations when object of mobbing may use complaint. Extension was made with inclusion the link on provision § 13 section 3 of Slovak Labor Code. This act makes way for object of mobbing to complain his/her employer. In accordance of provision § 13 section 4 of Slovak Labor Code employer must respond on complaint, secure the correction. If employer makes deterrent, undesirable environment at workplace, he must waive of this acting. If the victim of mobbing suffered any consequences of the act, employer must remove them. The manners of solving set up in provision § 13 section 4 of Slovak Labor Code have general nature. Therefore employer shall regulate detailed procedure about solving the mobbing at internal normative act (for example in working order). While we speak about internal normative acts which are made with concurrence of social partners, they may influence the content of these documents.

The victim of the mobbing behaviors usually does not know how rights she/he has, which ways of protection may use. The victim rather decides to change his/her employment like escape. This act is one of the causes of fluctuation which has a negative impact on labor productivity at business. The consequence of this situation is that employer must take on a new employee. Taking on a new employee needs the cost for her/his training. New employee has not competent skills. For this reason the problem of mobbing must be for employer important like is important for him to secure, for example, healthy working conditions. The question is if increasing of instruments of legal protection against mobbing means an effective manner of solving the problem. Effective protection means that toll of protection is easily available and efficient. Complaint fulfils the condition of easily available toll of protection. Legislator does not set up any form and terms of complaint. There is no obligation to file complaint in any period stipulated by law. Complaint must content the description of acting, who was a mobber, indication of witnesses. Using of this toll it may be effective in the cases if there is mobbing between employees. It is not conclusive if the mobber is one employee, or group of employees or primary employee, thus persons who do not decide about whole life of organization. If employer is a mobber, person who decide about whole life of the organization, about personal, financial questions, usually owner, the Slovak Labor Code sets up the employer the obligation to react on complaint, manner how to correct the consequences and the term in which must do this things. But what in the case if employer is passive? The provision § 13 section 4 of Slovak Labor Code does not solve this question. The solution of this question may be in participation of the social partners like investigator or control body which may initiate filing complaint to labor inspection or which may have right to plead like witnesses. At present employee must bring an action according the provision § 13 section 5 of Slovak Labor Code. Employee is a plaintiff and employer is a defendant. Whereas that provision § 13 section 5 of Slovak Labor Code considers the behaviors regulate in provision § 13 section 3 of Slovak Labor Code for kinds of discrimination, burden of proof lies on employer. Employer must prove that there was not any kind of mobbing. We write that before the objects of mobbing sue the employer, they must not file complaint. But complaint may be used like ancillary

evidence. This document court may take into account when decides about case like an enormous circumstance, like a signal that employer wants to hide whole problem.

If there is a situation that another employee is a mobber and the victim is complaining but employer is passive, victim may initiate judicial proceeding. In this situation is a defendant not employee who is a mobber but still employer, because the employer is responsible that tolerate mobbing at workplace. Complaint may be used like evidence. An unsettled complaint may be classified like form of participation on these acts. Danger of judicial protection is in the length of the judicial proceeding. At time of the bringing an action to issuing a decision may this undesirable behavior continue. Employee who is a victim of mobbing must use one of kinds of preliminary ruling in accordance of Civil Proceeding Act No. 99/1963. Therefore this way of protection may dissuade employee.

The increase of situations when victim of mobbing may use a complaint, we can perceive like consolidation of protection of employee's personality and his/her personal rights only in situation if employer wants to eliminate mobbing at workplace. It could be useful if in the process of solving can participate the representatives of employees like it is in Czech Republic. Czech legislator sets out that complaint must be discussed with social partners. We think that legislator could consolidate the participation of social partners by extended their powers, for example, that may contact control state organs or participate on judicial proceedings. The reckless of interdiction sets up in provision § 13 of Slovak Labor Code could be considered like breach of labor discipline. Control state organs for the area of employment relationships should make the lectures at workplace where they could provide the information about this negative social phenomenon. But if employer does not want to solve this problem then employee must sue the employer or change his/her employment.

2 TRADE UNION'S AFFILIATION vs. PERSONAL DATA PROTECTION

Amendment to Slovak Labor Code has intervened to provision § 41 of Slovak Labor Code which regulate the area of pre-contractual relationships and protection of personal rights of natural person - applicant, especially their privacy and personal data protection⁷. Change was made in provision § 41 section 6 of Slovak Labor Code from which was omitted the word "trade union affiliation". Provision § 41 section 6 of Slovak Labor Code which sets up circle of information which employer does not ask from applicant. Legislator has made situation that from 1 September 2011 employer may ask applicant about his/her trade union's affiliation. From Explanatory statement to the latest amendment to Slovak Labor Code we can learn that legislator decided for this change so that employers might require trade unions, which want to operate at their workplaces and represent whole their employees, about demonstration if it has a sufficient membership ground. According provision § 230 section 3 of Slovak Labor Code "if trade union want to represent all employees at workplace, it must demonstrate that 30 % of employer's employees are member of this trade union."

Detection of trade union's affiliation is relevant if we speak about couple of applicants, which are employees and want to change their employment, because they may be members one of the trade unions. Therefore the next interpretation will be focused right on this couple of applicants.

Whole provision § 41 of Slovak Labor Code regulates relationships between employer and applicant. In this stage employer obtains information only from applicant, from his/her entrance documents, write or verbal references from the previous employment. Therefore the philosophy or reasoning in Explanatory statement why legislator have decided to exclude restriction to ask about trade union's affiliation is illogical. In

⁷ BARANCOVÁ, H.: *Zákoník práce. Komentár. 1. vydanie*. Praha: C. H. Beck, 2010, p. 5.

accordance of Explanatory statement employer will be able to require information from trade union if person – applicant is a member of this trade union. This act we may consider like manner how legislator expands circle of subject from who employer may require information about applicant. But applicant does not know about this process. The data about trade union's affiliation is a special category of personal data in accordance of provision § 8 section 1 of Personal Data Protection Act No. 428/2002 (the next "Personal Data Protection Act"). These data may be processed only with former consent of data subject or if there are situations established in provision § 9 section 1 a) to f) of Personal Data Protection Act. Job interview it is not one of this situations, therefore employer will not require trade union's affiliation without consciousness of applicant or without his/her consent.

Natural person provides its personal data when she/he entering to trade union. These personal data may be used only for evidence. Trade union may not provide these personal data another person while this obligation is not established in act and there must be defined purpose of their exploitation. The same situation is if we speak about providing information to another subject about membership. Thus there must be fulfilled requirements for legitimacy, legality and proportionality, because we speak about infringement to the privacy of person⁸. The simply manner like trade union may show its ground of memberships is providing list of its memberships which contents their name and surname. From this sign everybody may identify trade union's affiliation of person and thus detects its personal data which has special protection. If trade union has not consent of data subject that it may provide his/her name and surname in list of membership, then trade union cannot provide this information to another person. If we speak about list of memberships, trade union must have consents from all persons who are its memberships. This is the same in the case if this obligation is not established in act. The opposite process would be in contrary with requirements which are established in union law, especially from *Directive No. 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data* (the next "Directive No. 95/46/EC") which is signed like "General directive"⁹. Especially we speak about respect of principles of protection of individual privacy, including personal data protection. These principles are: abovementioned principle of legality, legitimacy and proportionality. General direction sets up the next principles – **principle of finality, transparency, confidentiality, safeguard and control**¹⁰.

Court of Justice of the European Union (the next Court of Justice) in the case **The Bavarian Lager Co. Ltd. vs. Commission of the European Communities**,¹¹ stated, that introduction of member's name of professional organization on list of participants at organized event, it does not mean infringe to privacy of this member. The same situation is if statement of this member is recorded, because it is an opinion of organization which he/she represents. Court of Justice excludes professional activities from right to privacy, although European Court of Human Rights in its decisions states that article 8 of Convention for the Protection of Human Rights and Fundamental Freedoms, which contests right to privacy, covers not only family relationships but also professional activities¹². Requirement for

providing of trade union's affiliation in pre-contractual relationships we cannot consider for representation of trade union. Thus we cannot speak about performance of professional activities. Trade union's affiliation means relation of natural person to spectrum of opinions represented by trade union, anything what makes relation to society, therefore requirement of trade union's affiliation means requirement of personal opinions and attitudes of this person and thus interference to his/her right of privacy. Therefore employer cannot require this data with reason that there is decision of Court of Justice, because the participation on job interview is not performance of professional activities.

In this case how legislator justified this change in Explanatory statement we may speak about situation when employer is able to contact trade union with requirement if applicant is a member of this trade union or not. Trade union is not able react on requirement because providing of trade union's affiliation is a processing of personal data, especially special category of personal data. Processing of these data is bound with consent of applicant or there must be situations which are established in provision § 9 of Personal Data Protection Act.

If there is situation which is established in provision § 230 section 3 of Slovak Labor Code, trade union must respond and provide information from which employer could find out that obligation of representation of 30 % of all employees is fulfilled. But this provision we do not connect with provision of 41 section 6 of Slovak Labor Code. Provision § 230 section 3 Slovak Labor Code regulates the operating of trade union at employer's workplace and not process of receiving of new employees. This situation we can subordinate under the provision § 9 section 1 a) of the Personal Data Protection Act.

Receiving of new employees is a very difficult process not only for employer but also for person who is an applicant. Employer wants to obtain about applicant a lot of information which may help him with decision which applicant is suitable for his business. The main criteria which influenced employer's decision are question of costs and loyalty to employer. Some questions during job interview may intervene to applicant's privacy. Thus legislator sets up boundaries which information employer may request from applicant. These boundaries are contested in provision § 41 of Slovak Labor Code. Boundaries have nature of restriction (data which may not be requested) or option which is conditioned by fulfilling another requirement. Provision § 41 section 6 of Slovak Labor Code, as was mentioned, sets up the circle of information which employer may not require from applicant. It contests restriction. The latest amendment to Slovak Labor Code has deleted term "trade union's affiliation" from this provision. The legislator has made situation that employer is able to require this information. In the analysis of this change we pointed that trade union's affiliation is personal data which has special protection in accordance of provision § 8 section 1 Personal Data Protection Act. Personal Data Protection Act states that is restricted to process these personal data. Exception from this restriction is established in provision § 9 of Personal Data Protection Act. They can be processed if there is consent of data subject or if there is one of established situations in provision § 9 section 1 a) to f) of Personal Data Protection Act. This act is *lex specialis* in relation of regulation in Slovak Labor Code. From this reason question of restriction of detection of trade union's affiliation does not require regulation in Slovak Labor Code, because we have special regulation in special act – Personal Data Protection Act. This act considers like special personal data political and religious affiliation. The restriction of detection of political and religious affiliation in provision § 41 section 6 d) of Slovak Labor Code was not affected by its latest amendment. Nor in these cases the restriction would not be set up in Labor Code. The restriction in these cases is established in Personal Data Protection Act. We may speak about double regulation which highlights the restriction of detection of this information and about double protection of personal data of applicant. Before the latest amendment to Slovak Labor Code this situation was the same if we speak about trade union's affiliation.

⁸European Court of Human Rights requires respect of these principles. See judgments: Case of Nimietz v. Germany from 16 December 1992, Case of Huvig v. French from 24 April 1990, Case of Amann v. Switzerland from 16 February 2000, Case of Rotaru v. Romania from 4 May 2000, Case of Z. v. Finland from 25 February 1997, Case of Copland v. The United Kingdom from 3 April 2007.

⁹KUNER, Ch.: *European data privacy law and online business*. Oxford: University Press, 2003, p. 17.

¹⁰HENDRIKX, F.: *Employment privacy law in the European Union: Surveillance and monitoring*. Intersentia, 2002, p. 4.

¹¹See the judgment of Court of Justice of the European Union in the case **The Bavarian Lager Co. Ltd. vs. Commission of the European Communities**, case T-194/04, from 8 November 2007.

¹²Explanatory of article 8 of Convention of protection of human rights and freedoms made by European Court of Human Rights covered professional activities to right of privacy. See judgments: Case of S. and Marper v. The United Kingdom from 4 December 2008, Case of Amann v. Switzerland from 16 February 2000.

During job interview applicant is subjected to not only variety of questions but also has negative position, because he/she has not knowledge about his/her personal rights. Applicant may know that he/she has any right to privacy, but he/she does not know that this right entrance with him/her to every legal relationship and that employer does not be able to require any information from applicant. This legal darkness is for the benefit of employers. They have a great variety of ways how obtain information from applicants (for example they formulates the form of consent with processing of personal data, or they condition fulfillment of e-application form on providing any information). The double restriction was justifiable. Employer was wised up (if he does not know detailed regulation of personal data protection) that asking on trade union's affiliation is restricted. On the another part of the problem the internet portals, which offers labor, provide for their visitors information concerned with area of employment relationships, for example, pre-contractual relationships. It is a way how natural person – applicant may obtain information about his/her rights and duties. The process of information consists from induction of concrete provision without relevant explanatory with which legal statement has connection.

We think that situation which was made by the latest amendment to Slovak Labor Code in provision § 41 section 6 d) should help employers to reach situation how trade union could not operate at their workplace.¹³ Thus lower legal knowledge about rights of applicant may be abused from employer for the abovementioned purpose – disabling of operating of trade union at workplace. This change has negative influence on legal guarantee in connection of protection of applicant's personality, especially his/her privacy and personal data protection. If employers shall require providing trade union's affiliation from applicants at job interview this acting will be contrary to not only with Slovak legal order but also with international and union right. In this connection Court of Justice stated, "that is necessary distinguish personal data which intervene to privacy and personal data which have not this character."¹⁴ Court of Justice points that special personal data has this character where in accordance with *Direction No. 95/46/EC and Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data* appertains trade union membership too. This is in contrary with protective function of labor law which influences on pre-contractual relationships too and its function is to protect applicants because his/her position at job interview is very leak. When the number of applicants prevail on free places (like in this time), we do not agree that this change may subscribe to increasing of employment in Slovak country. For comparison in Czech Republic legislator placed the double protection for sensitive personal data not only for applicant but also for employees too. The protection is established in Personal Data Protection Act No. 101/2000, especially we speak about provision § 4 b) and provision § 9 of the abovementioned act. The restriction of processing sensitive personal data is in provision § 31 and in provision § 316 section 4 of Czech Labor Code (Act No. 262/2006).

Conclusion

In this article we try analyze several changes which were evoked by the latest amendment to Slovak Labor Code and their impact on selected problems of protection of personal rights of employees and applicants. Changes which have been bringing by the amending in lawful state should not cause unnecessary loading for its citizens. From the view of amending changes we may allege that they have established considerable

disproportions between rights and duties of employee and employer. Slovak legislator, how we point in this article, makes ways that employers are able to abuse lower legal knowledge of their employees and applicants. This situation reduces the measures of protective function of labor law and has negative impact on social guarantees of employees (include potential employees).

The deficiencies in legal regulation which we analyze in this article therefore they have brought us to conclusion that changes which were made by the act No. 257/2001 have caused weakness of protective function of labor law and thus reduction of quality of protection of personal rights of employees.

Literature:

1. BARANCOVÁ, H.: *Zákonník práce. Komentár. 1. vydanie.* Praha: C. H. Beck, 2010, 673 p. ISBN 978-80-7400-172-7.
2. BARINKOVÁ, M. – TROJAN, J.: *Etické aspekty zabezpečenia a ochrany dôstojnosti zamestnanca.* In: BARANCOVÁ, H. (ed.): *Pracovné právo 21. storočia.* Plzeň: Aleš Čeněk, 2009, 172 – 184 p. ISBN 978-80-7380-025-3.
3. BULLA, M. - ŠVEC, M.: *Ochrana súkromia zamestnancov pri prevádzkovaní kamerového systému na pracovisku (národné a európske východiská).* In: *Justičná revue*, 62, 2010, č. 10, 1062 – 1080 p. ISSN 1335 - 6461.
4. European agency for safety and health at work highlight that there is a thread between mobbing and health at work. See. European agency for safety and health at work: *Mobbing at work.* In: *Facts 23.* Bilbao: European agency for safety and health at work, 2003, 4 p.
5. HENDRIKX, F.: *Employment privacy law in the European Union: Surveillance and monitoring.* Intersentia, 2002, 321 p. ISBN 90-5095-239-9.
6. JANÍČOVÁ, E.: *Kolektívna zmluva – lex contractus realizácie sociálneho dialógu a zodpovedného podnikania.* In: BARINKOVÁ, M. (ed.) *Európska dimenzia podnikovej sociálnej zodpovednosti a jej vplyv na reguláciu pracovnoprávných vzťahov, zborník príspevkov účastníkov vedeckého sympózia s medzinárodnou účasťou.* Košice: Univerzita P. J. Šafárika v Košiciach, 2009, p. 191 – 193, ISBN 978-80-7097-780-4.
7. KUNER, Ch.: *European data privacy law and online business.* Oxford: University Press, 2003, 322 p. ISBN 978-0-19-928385-9.
8. LEYMAN, H.: *The Mobbing Encyclopaedia. Bullying, Whistleblowing. The Definition of Mobbing at Workplace.* Available on: <http://www.leymann.se/English/12100E.HTM>.
9. ŽOŤČÍNOVÁ, V.: *Limity ochrany práv osobitných kategórií zamestnancov (žien, tehotných žien, matiek, mladistvých) v kontexte medzinárodného pracovného práva.* In: *Dny verejného práva, zborník príspevků z mezinárodní konference.* Brno: Masarykova univerzita v Brně, 2007, 1265 - 1273 p. ISBN 978-80-210-4430-2.

Primary Paper Section: A

Secondary Paper Section: AG

¹³ On the lower number of trade unions which operate at Slovak workplaces is pointed in article: BULLA, M. – ŠVEC, M.: *Ochrana súkromia zamestnancov pri prevádzkovaní kamerového systému na pracovisku (národné a európske východiská).* In: *Justičná revue*, 62, 2010, č. 10, s. 1067 – 1069.

¹⁴ See the judgment of Court of Justice of the European Union in the case *The Bavarian Lager Co. Ltd. vs. Commission of the European Communities*, case T-194/04, from 8 November 2007.

BAYESIAN ESTIMATION OF REAL BUSINESS CYCLE MODEL: THE CASE OF POLAND

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Abstract: This paper presents the result of Bayesian estimation of real business cycle model augmented with mechanism of indivisible labor. We evaluate the structural parameters using quarterly data for Poland from 1997 to 2011. Methodology of the estimation is based on Bayes theorem. We use Kalman filter to estimate likelihood function and Metropolis algorithm to obtain posterior distribution for structural parameters. Our results are as follows. Firstly, we find that all estimated parameters are significantly greater than zero. We also find significantly greater value of the elasticity of output with respect to capital stock than it is assumed in standard calibration. The fit of model is relatively good taking under consideration model's simplicity. Moreover, the analysis of model's dynamics shows that capital stock and consumption are highly persistent in response to positive shock in technology.

Keywords: Real Business Cycle, Bayesian estimation.

1 Introduction

The Real Business Cycle model (hereafter RBC) is one of the cornerstones of the modern macroeconomics. It analyzes the aggregate dynamics of economy as the result of the optimal microeconomic decisions taken by individual agents, who tend to maximize their stream of current and discounted future utilities subject to aggregate dynamics and resource constraint of the economy. Moreover, the framework of the RBC model includes uncertainty, as a result of the stochastic random process (a structural shock), so agents can only expect future values of economic variables. It is assumed that they expect them in rational way, using the information set of all current and past realization of endogenous variables. In the RBC it is also assumed that all prices, including goods and factors, are fully flexible and all markets are in equilibrium [see e.g.: Kydland, Prescott, 1982; Long, Plosser, 1983; King, Plosser, Rebelo, 1988; Plosser, 1989; Stadler, 1994].

This paper presents the results of the estimation of the RBC model for a Polish economy. We choose Hansen's real business cycle model [Hansen, 1985] which contains the mechanism of indivisible labor. Such model has good empirical performance in comparison with other standard RBC models presented in the literature [see Hansen, Wright, 1992]. To estimate structural parameters of the model we use Bayesian approach which is recently more often used to analyze dynamic stochastic general equilibrium models (DSGE)¹.

The rest of the paper is organized as follows. Section 2 presents theoretical model. We only focus on log-linear approximation of the equilibrium conditions. All variables are expressed as the percent deviation from the steady-state. Section 3 discusses Bayesian techniques and statistical data that have been used to estimate structural parameters. Section 4 contains results of estimation including: the posterior distributions of estimated parameters, the fit of the model and the posterior distributions of the impulse response functions for endogenous variables which present expected dynamics of the model after including uncertainty about estimated parameters. Section 5 concludes.

2 Structure of the model

From the beginning of their existence, the real business cycle models have had serious problems with fit to labor market mechanism. Observed in the data relative high variation in hours compared to output couldn't have been explained by the RBC without making an assumption of high elasticity of labor supply. However, high level of elasticity was at odds with

microeconomic evidence [Hansen, 1985, p. 305; Mankiw, 1989, p. 85 – 86; Summers, 1986, p. 24].

In considered model the above-mentioned problem is omitted by assumption that labor is indivisible which implies that individuals can only work full-time or be unemployed. Therefore agents do not choose amount of labor which they supply to the market, but a contract with a probability of working full-time. The random variable, called an employment lottery, decides which agent will work. Moreover, complete market of state-contingent securities against unemployment is included in the model. All agents are then identical so we can analyze social planner problem [Hansen 1985, p. 316-317; McCandless, 2008, p. 112-113]. Implementation of indivisible labor also implies that preferences of agent are described by the quasi-linear utility function with decreasing marginal utility of consumption and constant marginal disutility of labor.

According to Hansen's model, output (y_t) is generated by using two factors: physical capital (k_t) and labor effort (h_t). We assume that all firms have access to the identical Cobb-Douglas production technology with constant returns to scale. This function can be expressed, in log-linear terms, as²:

$$y_t = z_t + \alpha k_{t-1} + (1-\alpha)h_t \quad (1)$$

where: $\alpha \in (0,1)$ is the elasticity of output with respect to capital, and z_t represents level of technology which follows a stationary autoregressive process:

$$z_t = \rho z_{t-1} + \varepsilon_t \quad (2)$$

where: $\rho \in (0,1)$ is an autoregressive parameter and $\varepsilon_t \sim i.i.d.N(0, \sigma^2)$ denotes the technological innovation.

Moreover, the single good has to be either invested (i_t) or consumed (c_t), so in the log-linear terms following resource constraint must be satisfied:

$$y_t = \frac{c}{y} c_t + \frac{i}{y} i_t \quad (3)$$

where: $\frac{c}{y}$ and $\frac{i}{y}$ are shares of consumption and investment in output in steady-state respectively.

In the model capital stock evolves according to standard law of motion which in log-linear terms is given by:

$$k_t = (1-\delta)k_{t-1} + \delta i_t \quad (4)$$

where $\delta \in (0,1)$ is the rate of capital depreciation.

The preferences of the representative household are described by utility function which is log-linear in consumption and linear in labor effort. Moreover, representative household tends to maximize the expected value of the stream of current and discounted future utilities subject to: (i) production function, (ii) law of motion for capital stock and (iii) resource constraint with respect to: consumption, labor and future capital stock under no-Ponzi-game condition. The solution of this problem yields first order conditions which consist of the Euler equation and the labor supply equation.

The Euler equation equals the marginal cost in terms of utility of investing single additional unit of good into capital stock with the expected marginal utility gain in the next period, while the labor supply equation implies that the marginal rate of substitution between labor and consumption must be equal the marginal product of labor. These equations can be expressed in log-linear terms as:

¹ The recent examples of papers which use Bayesian techniques to estimate DSGE model are e.g. Schorfheide [2000], Smets, Wouters [2003; 2007] or Rabanal and Rubio-Ramirez [2005].

² For technical details on derivation of real business cycle model (with or without indivisible labor) see, among others, McCandless [2008], Hatley, Hoover, Salyer [2006] or Kuchta, Pilat [2010].

$$c_t = E_t(c_{t+1}) - [1 - \beta(1 - \delta)]E_t(y_{t+1} - k_t) \quad (5)$$

$$c_t = y_t - h_t \quad (6)$$

where E_t denotes the expectation operator conditional on information available at time t and $\beta \in (0;1)$ is the discount factor.

3 Method of estimation and data

In this part we present the method of estimation which is used to estimate structural parameters of the RBC model. The procedure of estimation consists of several steps³. In the first step the model (equation (1)-(6)) is solved using perturbation method based on first order approximation of the policy and transition functions [Schmitt-Grohe, Uribe, 2004]. The solution of model can be interpreted as the transition equation in the state-space representation of the DSGE model. In the second step we use empirical time-series to construct measurement equation to obtain state-space model. In the next step the Kalman filter is used to evaluate likelihood function [see Hamilton, 1994, p. 372-409; Canova, 2007, p. 214-220; Commandeur, Koopman, 2007]. After that we can use Bayes theorem to construct posterior distribution of parameters of interest according to the formula below [Fernandez-Villaverde, 2010, p. 9]:

$$p(\theta | x^T) = \frac{p(\theta)p(x^T | \theta)}{\int p(\theta)p(x^T | \theta)d\theta} \quad (7)$$

where: $p(\theta | x^T)$ represents posterior distribution, $p(\theta)$ is the prior distribution, $p(x^T | \theta)$ is the likelihood function and $\int p(\theta)p(x^T | \theta)d\theta$ denotes marginal density of data.

To obtain the posterior distribution of parameters we apply Metropolis [Metropolis, et. al., 1953] algorithm which consists of two chains, each of 1.000.000 draws [An, Schorfheide, 2007; Fernandez-Villaverde, 2010; Smets, Wouters, 2003; Rabanal, Rubio-Ramirez, 2005]. To evaluate posterior distributions we use only the last 200.000 draws⁴.

In the above-mentioned procedure of estimation which is based on the state-space model, we can divide endogenous variables into two groups: observable and non-observable. The first set consists of: output, consumption, investment and labor. We use data set for a Polish economy from I quarter 1997 to II quarter 2011 which consist of real GDP, real individual consumption expenditure, real gross fixed capital formation and average number of hours worked during the reference week as the proxy of labor⁵. All data were expressed as logs of per capita units, seasonally adjusted and transformed in the percent deviation from steady-state using Hodrick-Prescott filter.

4 Results

Before starting the estimation it is indispensable to define the prior distributions for estimated parameters. The assumptions regarding the prior distribution for estimated parameters are collected in table 1. For all structural parameters we choose beta distribution, because of economic restrictions about possible values of particular parameter. Moreover, as means of distributions we use values that are often used in literature on real business cycle models based on data for postwar US economy⁶ [see e.g. Kydland, Prescott, 1982; Hansen, 1985;

Hansen, Wright, 1992]. We also assume beta distribution for the autoregressive parameter with mean 0.5 and standard error 0.25⁷.

[Table 1.]

The results of the estimation are presented in table 2⁸. The summarized statistics for the posterior distributions prove that all structural parameters, except the discount factor, are identified in estimation⁹. Moreover, they are significantly different from zero. In the case of obtained discount factor posterior is very similar to assumed prior. It is probably caused by very strict prior that was chosen.

[Table 2.]

The mean of posterior for the elasticity of production function is evaluated at the level of 0.59 and it is considerably greater than prior mean. It is also similar to our earlier estimation of the elasticity of production function with respect to capital [Kuchta, Pilat, 2010, p. 28-29] which we use in the calibration exercise. The mean of posterior for the rate of capital depreciation is evaluated at the level of 0.036 and it is greater than assumed prior mean. Moreover, it is also two times greater than value which was found for a Polish economy using annual data on capital stock and its depreciation [Kuchta, Pilat, 2010, p. 28-29]. However both of them are in the 90% posterior interval for this parameter, so they are not significantly different.

The parameter of the autoregressive process for technology is estimated at higher values than prior mean. We obtain a tight distribution with mean 0.83 and the 90% interval of distribution from 0.7 to 0.986. This result proves that technological disturbances are rather persistence in Polish economy. It is also coherent with easier analysis of RBC model in which it is assumed that shocks are highly persistent. However, our estimations may be caused by structure of the model in which we only assume single source of economic disturbance.

Following Adolfson, Laseen, Linde and Villani [2007] and Kolasa [2009] we compare actual series used in estimation with one-step-ahead forecast for observed variables to evaluate fit of the model. Forecasts of observed variables are estimated by applying one-side Kalman filter. The comparison of those two series is summarized in figure 1.

[Figure 1.]

The comparison of forecast series with the observable one proves that estimated model does good job at tracking output. Obviously, the fit for other series is not so good. Predicted series for consumption seems to be quite smooth in comparison with the statistical data. Moreover, average working hours seem to be more volatile than in the sample. However, the overall in-sample fit of the model seems to be acceptable, especially in the light of model's simplicity.

Figure 2 presents selected moments (mean, 5th and 95th percentile of distribution) of the posterior distributions of impulse response functions for the endogenous variables to temporary and positive shock in technology¹⁰.

[Figure 2.]

After positive technological shock, the level of technology rise immediately. In the next periods, it gradually returns to the level of long-run equilibrium. Moreover, response in technology is significantly greater than zero for about two years after shock.

³ Before estimation, we calibrate the share of consumption and of investment in output at the level of 63% and of 21% respectively. These values were found on the basis of empirical data for Polish economy.

⁴ We use Gelman-Brooks statistics to be sure that the MH algorithm will converge.

⁵ All data come from the Polish Central Statistical Office.

⁶ We do not want to use more reasonable values for a Polish economy, because we would like to check, if there is statistical information on the estimated parameters in the sample that we use in estimation. In other words, we would like to check if there are possible identification problems for the particular parameters.

⁷ Chosen priors are rather loose for all parameters except the discount factor. In this case we decided to choose strict prior because of strong connection between this parameter and the steady-state value of real interest rate, which we do not treat in estimation as observable.

⁸ The software used is Dynare 4.02.

⁹ For more details about issue of identification in the estimation of DSGE models see, among others, [An, Schorfheide, 2007; Canova, Sala 2009].

¹⁰ In the presented results, the temporary technological innovation (ε_t) hit the economy at the end of the second quarter of first year.

Temporary high level of technology causes higher level of production. Moreover, it increases the level of the marginal product of labor and marginal product of physical capital. Changes in marginal productivity of factors encourage individuals to invest and work more than in a steady-state. Investment and hours worked increase immediately after shock and gradually return to their steady-state level. The response in investment is significantly greater than zero for about 2 years after shock. On the contrary, the response in labor effort is considerably greater than zero for about 5 quarters, but after five and a half year we observe that it starts to be significantly lower than zero.

Moreover, the positive shock in technology causes that consumption and capital stock increase gradually after shock. Their hump-shape response is highly persistent, especially in comparison with output. The maximum level of response is observed after about 2 years in case of consumption and after 3 years in case of capital stock. It is also observed that posterior intervals are broad in both cases which suggest rather diffuse posteriors for this response.

5 Results

This paper presented results of estimation of real business cycle model with mechanism of indivisible labor for Polish economy. This model was chosen because of good empirical performance in comparison with other standard RBC models. It was estimated using Bayesian techniques. Our method of estimation was based on the state-space representation of DSGE model. To evaluate the posterior distribution for particular parameters the Metropolis algorithm was used.

Our main results are as follow. Firstly, we obtained that all structural parameters were significant. Moreover, all parameters, except for the discount factor, were identified in estimation. Secondly, obtained parameters were partly comparable with other studies for Polish economy. Thirdly, the overall in-sample fit was assessed as acceptable, especially taking under consideration model's simplicity. Fourthly, it was obtained that temporary, positive shock in technology increases levels of all endogenous variables. Moreover, only in case of consumption and capital stock it was observed hump-shape and highly persistent responses. Other variables have gradually returned to their steady-state levels after shock.

Literature:

1. ADOLFSON M., LASEEN S., LINDE J., VILLANI Bayesian estimation of an open economy DSGE model with incomplete pass-through, 72, *Journal of International Economics*, 2007, pp. 481-511.
2. AN S., SCHORFHEIDE F. Bayesian analysis of DSGE models, 26 (2-4), *Econometric Review*, 2007, pp. 113-172.
3. CANOVA F. *Methods for Applied Macroeconomic Research*, Princeton and Oxford, Princeton University Press, 2007, 492 p.
4. CANOVA F., SALA L. Back to square one: Identification issues in DSGE models, 56, *Journal of Monetary Economics*, 2009, pp. 431-449.
5. COMMANDEUR J.J.F., KOOPMAN S.J. *An Introduction to State Space Time Series Analysis*, New York, Oxford University Press, 2007, 174 p.
6. FERNANDEZ-VILLAVARDE J. The econometrics of DSGE models, 1, *SERIEs Journal of Spanish Economic Association*, 2010, pp. 3-49.
7. HAMILTON J.D. *Time Series Analysis*, Princeton, Princeton University Press, 1994, 800 p.
8. HANSEN G.D. Indivisible labor and the business cycle, 16 (3), *Journal of Monetary Economics*, November 1985, pp. 309 – 328.
9. HANSEN G.D., WRIGHT R. The labor market in real business cycle theory, *Federal Reserve Bank of Minneapolis Quarterly Review*, spring 1992, pp. 2 – 12.
10. HARTLEY J.E., HOOVER K.D., SALYER K.D. A User's Guide to Solving Real Business Cycle Models [w:] red.

HARTLEY J.E., HOOVER K.D., SALYER K.D. *Real Business Cycles. A Reader*, London and New York, Routledge, 2006, 651 p.

11. KING R.G., PLOSSER Ch.I., REBELO S.T. Production, growth and business cycles I: The basic neoclassical model, 21 (2), *Journal of Monetary Economics*, March 1988, pp. 195 – 232.
12. KOLASA M. Structural heterogeneity or asymmetric shocks? Poland and the euro area through the lens of a two-country DSGE model, 26, *Economic Modelling*, 2009, pp. 1245-1269.
13. KUCHTA Z., PIŁAT K. Zastosowanie modelu realnego cyklu koniunkturalnego Hansena do gospodarki Polski, 11-12, *Gospodarka Narodowa*, 2010, pp.
14. KYDLAND F.E., PRESCOTT E.C. Time to build and aggregate fluctuations, 50 (6), *Econometrica*, November 1982, pp. 1345 – 1369.
15. LONG J.B., PLOSSER Ch.I. *Real Business Cycles*, 91 (1), *Journal of Political Economy*, 1983, pp. 39 – 69.
16. MANKIW N.G. Real Business Cycles: A New Keynesian Perspective, 3 (3), *Journal of Economic Perspectives*, summer 1989, pp. 79 – 90.
17. MCCANDLESS G. *The ABCs of RBCs. An Introduction to Dynamic Macroeconomic Models*, Cambridge, Harvard University Press, 2008, 420 p..
18. METROPOLIS N., ROSENBLUTH A.W., ROSENBLUTH M.N., TELLER A.H., TELLER E. Equation of State Calculations by Fast Computing Machines, 21 (6), *the Journal of Chemical Physics*, June 1953, pp. 1087-1092.
19. PLOSSER Ch.I. Understanding Real Business Cycles, 3 (3), *The Journal of Economic Perspectives*, summer 1989, pp. 51 – 77.
20. RABANAL P., RUBIO-RAMIREZ J.F. Comparing New Keynesian model of the business cycle: A Bayesian approach, 52, *Journal of Monetary Economics*, 2005, pp. 1151-1166.
21. SCHMITT-GROHE S., URIBE M. Solving dynamic general equilibrium models using a second-order approximation to the policy functions, 28, *Journal of Economic Dynamics & Control*, 2004, pp. 755-775.
22. SCHORFHEIDE F. Loss Function-Based Evaluation of DSGE Models, 15, *Journal of Applied Econometrics*, 2000, pp. 645-670.
23. SMEST F., WOUTERS R. An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area, 1 (5), *Journal of the European Economic Association*, September 2003, pp. 1123-1175.
24. SMETS F., WOUTERS R. Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach, 97 (3), *the American Economic Review*, 2007, pp. 586-606.
25. STADLER G.W. Real Business Cycles, 32, *Journal of Economics Literature*, December 1994, pp. 1750 – 1783.
26. SUMMERS L.H. Some skeptical observations of real business cycle theory, 10 (4), *Federal Reserve Bank of Minneapolis Quarterly Review*, autumn 1986, pp. 23 – 27.

Primary Paper Section: A

Secondary Paper Section: AH

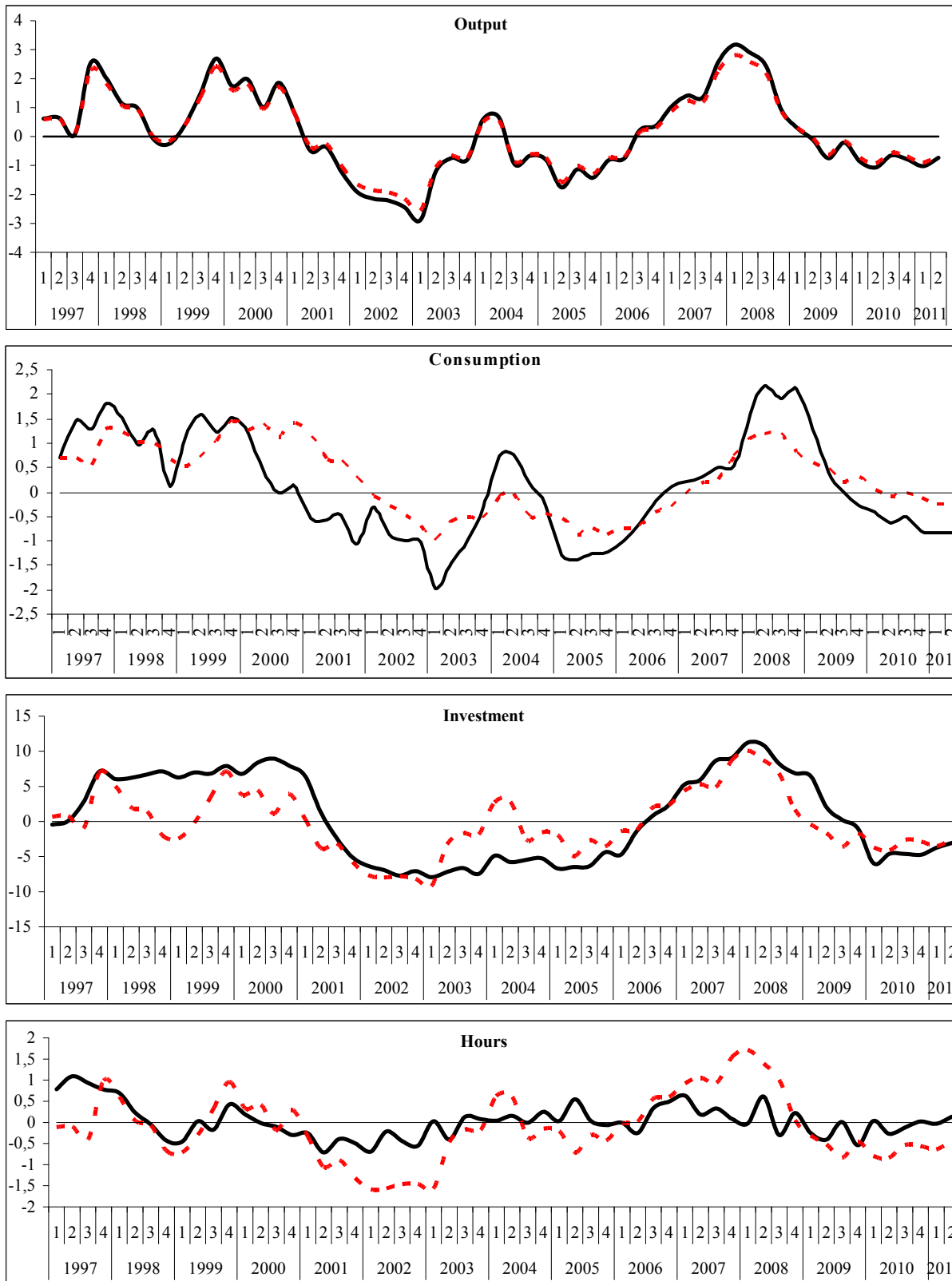
Table 1. Prior distributions for estimated parameters

Parameter	Symbol	Domain	Prior distribution		
			Type	Mean	St. error
Elasticity of production function with respect to capital	α	(0,1)	Beta	0.33	0.15
Discount factor	β	(0,1)	Beta	0.99	0.005
Rate of depreciation	δ	(0,1)	Beta	0.025	0.0125
Autoregressive parameter	ρ	(0,1)	Beta	0.50	0.25
Standard error for technological innovation	σ	(0; ∞)	Inv gamma	0.03	∞

Table 2. Estimation results: posterior distributions for estimated parameters

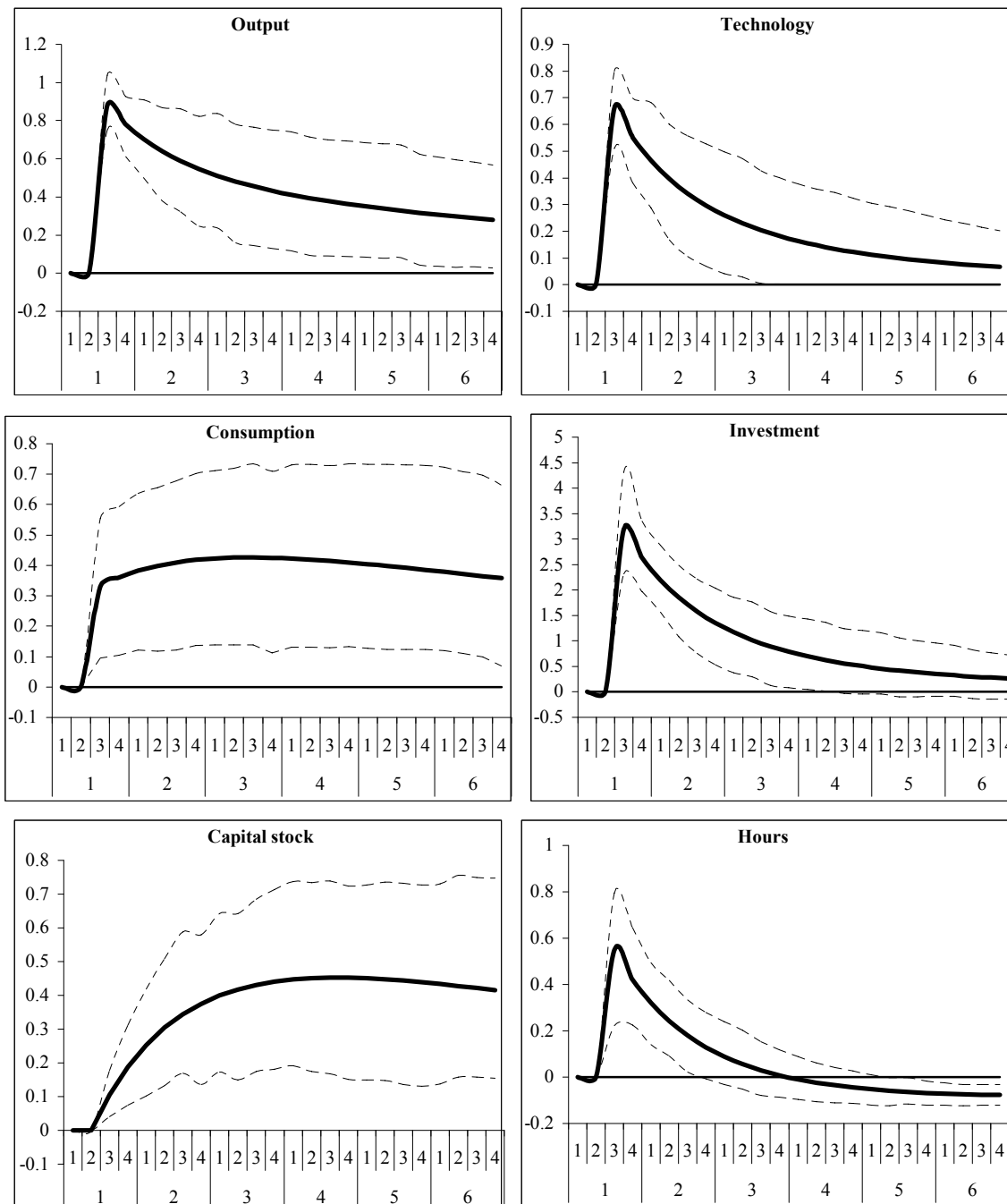
Parameter	Symbol	Posterior distribution			
		Mean	Mode	5%	95%
Elasticity of production function with respect to capital	α	0.594	0.614	0.409	0.780
Discount factor	β	0.990	0.992	0.983	0.997
Rate of depreciation	δ	0.036	0.026	0.009	0.062
Autoregressive parameter	ρ	0.830	0.830	0.707	0.986
Standard error for technological innovation	σ	0.007	0.006	0.005	0.008

Figure 1. Data and one-step-ahead forecasts.



Note: black solid line – data, dashed red line - one-step-ahead forecast.

Figure 2. The posterior distributions of impulse response functions for endogenous variables



Note: solid line – expected value, dashed lines – 5th and 95th percentile.

PROSUMER – A NEW TREND OF ACTIVE CONSUMPTION ON THE EXAMPLE OF BANKING SERVICES

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Abstract: The main aim of the article is to identify the contemporary active consumer in the Polish banking services market, i.e. the consumer who is no longer passive market player involved only in purchasing but changes into an active prosumer who influences both the offered service or banking product and its accompanying marketing activities. In addition, the presented article tries to answer the question what impact both the new technology and information society development have on the extent of the new trend of prosumption.

Keywords: prosumer, banking services, consumer, presumption

1 Introduction

Contemporary consumer is not only an active participant in the dialogue with a company, but he is also able to initiate process of communication and have a crucial influence on this dialogue. As a result, consumers are not considered to be a passive receiver of marketing message anymore, but they frequently take initiative, have a great knowledge concerning brand or its products and are eager to share this gained knowledge with others. In addition, contemporary consumers are also business partners since they take part in creation of new product solutions, contribute to product development in terms of quality and as a consequence are active members of development and production process of a particular company¹. The above described behaviour is typical for prosumers – consumers that actively participate in the market.

In case of market of banking services, the extent of offer individualisation is relatively bigger due to the specificity of banking products. As a result, well-educated and conscious consumers cease to be passive market players and change into prosumers, who are involved in either service development or marketing activities of a certain banking product. These actions are possible thanks to the development of information and communication technology as well as growing importance of information society.

A following article is an attempt to define and characterize a phenomenon of prosumption, basing on the secondary sources as well as data concerning Polish financial institutions and consumers existing in this market. The main aim of this work is to identify a contemporary prosumer in the Polish market of banking services, with the main focus put on different forms of prosumption activities of consumers as well as the opportunities that appear as a result of continuous technology development and access to various communication media

2 Prosumer – theoretical concept

The notion "prosumer" (i.e. combination of two words: producer and consumer) was introduced in 1970s by A. Toffler, who was of the opinion that the 'border' between producer and consumer is blurry and higher importance should be given to the new type of consumer – prosumer². He claimed that prosumer is a very specific market player, who 'produce products for their own concurrent or later consumption' and constitutes a part of so-called sector A (sector including people providing unpaid work for themselves, their families or for the society in which they live). Sector A is one of the parts of economic system next to the sector B, which includes production of goods and services for exchange³.

The concept of prosumption was introduced by Toffler in his popular book *The Third Wave*. Toffler claims that prosumption occurred in all of the three waves that he suggests describe social and economic development throughout history. In the first wave, which he dates to antiquity, the majority of community members were prosumers by necessity and on a technologically primitive basis. Only a few members of the community traded their surplus output (e.g., food, clothes, and entertainment) for things and services produced by others. In the second wave (just after the Industrial Revolution), people (with the exception of "housewives") produced primarily for purposes of exchange. By the third wave (the so-called post-industrial age), more people shifted much of their time from work and traditional commercial exchanges to prosumption activities. In a sense, prosumption has been brought back through the use of high technology⁴.

Prosumption is a process rather than a single act (e.g., purchase) and consists in an integration of physical activities, mental effort, and socio-psychological experiences. People participate in this process by providing their input of money, time, effort, and skills. The physical activities needed include manufacturing-like activities such as procuring, assorting, moving, combining, and changing inputs. The mental effort involved includes planning, evaluating, monitoring and regulating progress, whereas the socio-psychological experiences in here in various aspects of the process and its outputs and how they affect oneself and others. Therefore, we formally define prosumption as *value creation activities undertaken by the consumer that result in the production of products they eventually consume and that become their consumption experiences*⁵.

A. Toffler implied that the prosumption is to be developed as a result of two types of forces: he predicted transition from passive to active consumption on the basis of self-help movement, i.e. creation of voluntary organisations, consumer societies aiming at „helping each other” and information exchanging. As the second force, he listed conscious actions of some corporations - involvement of consumers in company activities that used to be realised by company itself. It was noted mainly in increase of self-service in the process of customer service and so-called do-it-yourself activities (self-service in department stores, solving technical problems by phone or serving as a bank teller at the ATM machine). Moreover, consumer involvement comprised also their contribution to the process of product development of a particular company. The original notion 'prosumer' corresponded to two types of interaction:

- Consumer – consumer: interaction based on the self-help movement, need of helping each other in solving problems;
- Company – consumer: interaction based on consumer involvement, including contribution to the design and development of products⁶.

At present D. Tapscott defines prosumption phenomenon as a desire for being into possession of products compatible with consumer's vision. It is possible because consumers become co-creators by the means of their conscious choice and actions⁷. Tapscott specifies a number of actions typical for contemporary prosumption:

- Meeting user needs: tailoring products according to specific consumer needs as well as more intensive consumer involvement in product design;
- Control elimination: product as a platform of own innovations;
- Availability of tools for customers and context

⁴ Ibidem

⁵ Gach D., *Poszukiwanie i wykorzystywanie wiedzy klientów*, E-mentor, (23) 2008, p. 1.

⁶ Rupik K., *Prosumenci w procesie planowania marketingowego*, W: *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Relacyjne aspekty zachowań konsumenckich*. Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2010, p. 332-333.

⁷ Tapscott D., Williams A., *Wikinomia. O globalnej współpracy, która zmienia wszystko*, WAIp, Warszawa 2008, p. 215-218.

¹ Domańska K., *Kim jest prosumenci*, *Marketing w praktyce*, (02) 2009, p. 35-36.

² Toffler A., *Trzecia fala*, Wydawnictwo Kurpisz, Poznań 2006, p. 306.

³ Ibidem

arrangement: products treated as a basis for experimenting;

- Partnership: consumers considered as partners⁸.

D. Tapscott indicates, however, that prosumers do not only tailor or personalize products; they set up prosumer communities in which they share information about products and exchange opinions⁹. As a result, prosumer is seemed to be not only a loyal consumer, but also rational and keen on participation in the creation of offer that is directed to them. Prosumer rewards brand both in the way of purchase as well as conveying information about this brand among other potential customers¹⁰.

Polish authors, A. Zawadzki and J. Przewłocka suggest to define prosumer as a person fulfilling at least two of the three following criteria:

- Seeks opinion of other internauts, especially when planning a product purchase;
- Issues opinion about products and brands in the Internet or asks questions about them;
- Participates in promotions, in which he co-creates products, slogans or advertising campaigns¹¹.

Taking into account the above mentioned criteria concerning prosumer, it seems to be crucial to specify factors that stimulate prosumption processes and contribute to popularization of this phenomenon: These are mainly as following:

- Increasing proportion of free time as a result of automatization of manufacturing processes and the need of taking advantage of it;
- Possibility of teleworking and combining it with other consumption activities at the same time;
- Development and popularization of education, especially continuing education of adults;
- Modification of work organization and revaluation of its importance in the human life; evolution of work significance – focus on creativity¹².

In addition, a special attention should be paid to the use of well-developed tele-information systems as well as introduction of new company approach to the consumer, resulting in overall modification of producer – consumer relation. Intensification of information exchange between company and its consumers and improvement of communication processes is mainly allowed thanks to the advanced tele-information systems. In this area, prosumers are characterized by such actions as: commenting or describing brands, products or services in the Internet, seeking information concerning new goods, sharing opinions about purchased products with other consumers and producers, recommending these products and taking an active part in configuring services or products they are planning to purchase¹³.

3 E-prosumer – influence of the technological advances on the phenomenon

A contemporary consumer is considered to be brave, conscious of their needs, demanding and curious to discover new opportunities. It is difficult to say if new consumption attitudes of XXI century consumers have appeared either as a direct consequence of technological innovations or consumers being conscious of their needs. Currently, an interaction between these 'two worlds' can be observed and new consumption attitudes are becoming common worldwide. Being an active consumer in the market, exchange of information, independence, judgemental attitude to purchases – these are contemporary consumer expectations that can be fulfilled due to development of communication and information technology.

As Toffler argued, increasing discretionary time from a shrinking workweek first provided a setting for change that allowed people to prioritize between a large array of alternative prosumption, recreation, and leisure activities. Second, higher education provided initiative for change by technology improvement, e.g. advanced household tools and machinery allow consumers to modify their belongings. Third, as the costs of skilled labor provided service companies rose along with the cost of other products relative to the cost of prosumption, people began to do these activities themselves. Fourth, people who have a high sensitivity to quality and a strong instinct for workmanship can realize that they can produce better goods and services than what may be available in the market. Finally, more people seek self-expression through producing their own goods and services as a matter of pride and self-fulfillment. What is important, is the fact that certain phenomena may increase the propensity to presume, such as technological advances or simply the availability of internet, whereas other factors may reduce the inclination (e.g., technological complexity – electronic components in cars and other products makes it difficult or impossible for most consumers to do their own maintenance work and may discourage prosumptive behaviors¹⁴. However, it must be agreed that appearance of new technology and tools that allow consumers to convey their opinions very quickly, create online trade communities, participate in social media development and generate other forms of online areas of information exchange, has contributed indisputably to the rising phenomenon of prosumption¹⁵.

In literature, the representatives of so-called Y and C¹⁶ generation, characterized as 'opposite to the old era consumers', are claimed to be the first prosumers – the creators of a new market reality. The main feature of theirs is their positive and active attitude towards new technology. The importance of the technology was confirmed in the research conducted by Polish research agency Gemius SA in 2008¹⁷, where 36% of the total number of examined internauts comprised of 'active consumers' while the other 64% represented 'an old' type of consumer. In addition, the research outlines that number of prosumers is growing all the time, which can be observed on the example of decreasing number of internauts making purchases in online stores without earlier search for opinion. In 2005 this number accounted for 43% of the Internet users, while in 2008 – 22%.

On the basis of Gemius SA research results, a typical model of prosumer can be created. The results are as follows: a typical prosumer is a man (59%), at the age of 19-34 (56%), with higher or incomplete higher education (45%). On the other hand, it can be assumed that the typical model of 'an old' type of consumer is a woman (54%), about 34 (24%) or 45+ years old (23%), with higher or incomplete higher education (34%) or secondary education (31%). Moreover, the research shows that the prosumers are more convinced (than the 'old' type of consumers) that the product advertisements consist of interesting information (27% vs 20%), as well as more frequently they are of the opinion that watching commercials constitutes a valuable way of entertainment (18% vs 12%). Additionally, prosumers prefer online advertisements rather than other forms of media (19%) and more often claim that the Internet adverts are helpful when looking for the suitable product or service (17%)¹⁸.

The above mentioned research results underline that so far more than 82% of Polish internauts encountered other consumers opinions concerning products and services brands. Primarily, these internauts belong to 25-34 age group and as for the opinions, they were mainly found at online stores websites and

⁸ Ibidem

⁹ Ibidem

¹⁰ http://www.tnsglobal.pl/uploads/images/1291/Konsument_Przyszlosci_Marcin_Herrmann.pdf, (30.11.2011).

¹¹ Zawadzki A., Przewłocka J., Prosumenci w polskim Internecie, raport Gemius 2008, http://pliki.gemius.pl/Raporty/2008/Prosumenci_raport_Gemius.pdf, (30.11.2011).

¹² Bywalec C., Konsumpcja w teorii i praktyce gospodarowania, Wydawnictwo Naukowe PWN, Warszawa 2007, p.153.

¹³ Gach D., op. cit., p. 1.

¹⁴ Xie C., Troye S., The active consumer: conceptual, managerial and methodological challenges of prosumption, (06) 2010, p. 2-6.

¹⁵ Wittich M., Prosumenci na granicy dwóch światów, Marketing w praktyce, (09) 2010, p. 14-15.

¹⁶ Generation Y – a group of people born in 80s and 90s, represented by the young, brave and well educated in terms of technology. Generation C – a group of people taking advantage of the opportunities given by new technologies, such as of sharing and exchanging information. Zółtek D., Marki zbiorowej wyobraźni.W: Marketing w praktyce, (02) 2009, p. 39].

¹⁷ Zawadzki A., Przewłocka J., op. cit.

¹⁸ Ibidem

online internet auctions (79%), at internet price comparison websites (56%), and every third person stumbles upon products and services opinions at internet forums and professional websites (38%). The most important fact, is that most of the examined consumers seeks these information when planning the purchase, only 18% encounters these information coincidentally, and 10% of them receives websites links from their friends¹⁹.

It is crucial, that the prosumer not only wants to receive information about products and services, but is also interested in creation of these tangible and intangible goods. This consumer is not satisfied with just the passive consumption, but wants to take an active part in consumption processes. Gemius research outlines that 24% of Polish internauts has taken part in presumptive actions, including 12% of actions aiming at creating product slogan, 7% of actions aiming at creating packaging and product itself and 5% of actions aiming at creation of advertising elements²⁰. As a result, companies have noticed that decisions concerning new products that used to be taken inside the organisation, currently require consumers consulting as well as precise observing consumers behaviour.

Summing up the above, both comfortable access to the new communication and information technology tools and the development of information society have noticeably influenced the appearance of prosumption and the main symptoms of this phenomenon are as follows:

- Self-banking – an active and individual dealing with self-service access channels,
- Personalization – process in which mass marketing reaches individual consumers and allows them to make independent decisions about product or service design and properties,
- Product hacking – process of product and services modification with the involvement of consumer. The process aims at improving and adjusting goods for consumer needs. Hacking is a process which is performed without the consent of the brand or producer,
- Crowdsourcing – process of taking inspiration, ideas and knowledge from consumers. It an opportunity given to customers to be heard and to share their opinions about current products or products that they are going to purchase,
- Collective Intelligence – process of shared intelligence of many consumers who are providing online their opinions about companies products or services. This global communication results in finding a collective solution/idea/suggestion about particular good. The core of the success is the involvement of a great amount of consumers all over the world²¹.

All the above outlined processes, on one hand enable the prosumers to co-create new value and on the other hand, allow the companies to gain new resources, such as intellectual capital. Frequently, the most valuable side-effect of these processes might be, as little as or as much as generating need for an entirely new product or service.

4 A contemporary prosumer in the market of banking services

A contemporary customer of financial institutions is a person that wants to be heard in the market and not only identifies with a certain brand but also devotes their time, energy and skills to have a real influence on the banking service or product in its process of creation. All these activities aim at obtaining a service/product accordant with consumer requirements and needs. Taking this into consideration, one may assume that the prosumer existing in the market of banking services is not likely to be satisfied with a standard product/service offer, but actively affects the product/service development as well as the way of its

offering²². Financial institutions are aware of the fact that the competitive environment extorts individualisation of products. In case of services, the extent of individualisation is relatively bigger, as a consequence of the specificity of services. Service is a very unusual type of product which is characterized by²³:

- Intangibility,
- Perishability,
- Inseparability,
- Simultaneity,
- Variability.

In turn, marketing of services is not free of the influence of the above mentioned characteristics of services. It is visible especially in terms of:

- Individualization and standardization,
- Complexity,
- Quality,
- Warehousing and time,
- consumer contribution in the service production.

In the process of services providing as well as in the process of customer service, the rule of complexity is to be obeyed and the central part of companies focus is to be customer²⁴. Global service corporations are aware of this fact and conduct an active dialogue with their customers. This trend is highly noticeable in Western Europe and the United States, where companies make the design tools accessible for the customers in order to allow them to co-create services. In Polish market few service companies follow this trend, however, still in some fields it is possible to observe an act of handing in the creation tools to consumers and treating them as co-creators of the service offer.

Market of banking services is a specific area of company-customer interaction, where the goodwill and credibility of a company is of a higher importance. Consumer evaluates the quality of the service not only on the basis of the technical quality (objective), but also takes into account its functional quality, i.e. correspondence with requirements and the extent of specialization, compliant with the individual needs.

Financial institutions, aware of more and more educated consumers, leave them an opportunity to create the offer, and in return, consumers having the best knowledge of their own needs, actively participate with them. In case of Polish banking services market, the prosumption trend seems to be at the primary phase of development, although it may be already observed in three most popular forms: personalization, crowdsourcing and self-banking. The most frequently mentioned examples of presumptive actions in the Polish banking market are:

- Customers communities sharing their knowledge concerning finance and aiming at building greater consumer awareness;
- Customers participation in creation of a particular product or service during e.g., promotional actions;
- Customers taking advantage of communication and information technology tools in order to deal with the products/services in terms of a self-service²⁵.

Certainly, the last mentioned example constitutes the most numerous groups of consumers, since it is estimated that at the end of 2010 as many as 15,7 mln Poles have owned online bank accounts, with 9 mln individuals actively using them²⁶. In this consumer group the presumptive activities can be mainly observed in the form of self-banking. Here, the self-banking may be defined as a substitute of a regular service, when the consumer by the means of self-service, resigns from the staff or service provider help and performs it on its own²⁷. In practice of banking services, self-service is slightly different – it is still the

²² Toffler A., op. cit., p. 36-307.

²³ Daszkowska M., Zarys marketingu usług, Uniwersytet Gdański, Gdańsk 1993, p. 16-18.

²⁴ Rosa G., Marketing regionalny na rynku usług, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2005, p.43-45.

²⁵ <http://www.zbp.pl/photo/netbank01.pdf> (30.11.2011).

²⁶ Ibidem

²⁷ Rogoziński K., Samoobsługa czy usługa? Albo o wpływie nowoczesnych technologii na usługi, Materiały Naukowe Katedry Usług Akademii Ekonomicznej w Poznaniu, nr 4, 200.1

¹⁹ Ibidem

²⁰ Szpunar M., Współczesny konsument - pasywny, czy aktywny prosument, W: Z. Zieliński (red.) Rola informatyki w naukach ekonomicznych i społecznych. Innowacje i implikacje interdyscyplinarne, WSH, Kielce 2009, p. 67-74.

²¹ Zółek D., op. cit., p. 41-42.

individual performance of a consumer, but under the supervision of the financial institution (bank), by the means of use of specific tools (usually in electronic form) enabling remote access to the operations which are finalized by the bank. The bank, both makes the necessary tools accessible and transfers competences to the customer. As an example, nowadays it is possible to deal with some of the activities that used to require specialist participation, by the means of self-service, e.g., opening the online bank account or online investing in capital funds. This active and individual participation of customers in the process of providing service is nothing but a typical form of presumption activity²⁸.

The second type of presumptive activity is so-called personalization – a process of co-creation product or service with the participation of consumer. It is essential that consumer makes the final decisions about the products features so that the product is tailor-made. What is interesting, is the fact, that new technology allows to adjust the product/service not only to the groups of consumers but even to the particular individuals having their own requirements. The core issue in this type of presumption activities is the possibility to configure the product/service by the means of joining individual modules offered by the service provider. In the Polish market of banking services, two forms of presumptive actions exemplify it²⁹:

- Enabling customers to modify the interface and design of on-line transaction system³⁰ as well as to adjust settings of online investment funds (e.g., mode of making orders, frequency of receiving information)³¹,
- Enabling customers to take advantage of the online applications for changing the design, colour, form of the product (e.g., prosumers beautify their credit cards with individually chosen photos or pictures)³².

Prosumers that take part in these activities are more interested in the offered banking product because are a co-creator of this product and generate positive image of the service provider.

Crowdsourcing is another form of presumptive actions taken by the customers in the market of banking services. It is mainly about sharing the knowledge, ideas and inspirations. The most well-known crowdsourcing example in the Polish banking market is Alior Bank – a financial institution that decided to ask the consumers for their opinions before setting up its activities in Poland. Alior Bank has built the consumer community by the means of online website where the consumers could define their needs and requirements concerning banking services³³. In return Alior Bank promised to take these suggestions while developing its offer and model of customer service. In addition, customers were encouraged by some money awards for their participation in this action³⁴. More than 93 thousand internauts took part in this action and registered on the website, most of whom decided then to open bank accounts in the above mentioned bank. Not only did the internauts help the bank to create an offer suitable for them and compliant with their needs, but also developed an active bank community group. Moreover, those of consumers that were actively involved in the bank 'building' had an opportunity to choose six last digits of their bank account number, which in turn is an obvious form of presumptive action, i.e., personalization. Another example of presumption phenomenon in the Polish market of banking services is the one concerning BZ WBK Bank. It created a special communication platform, called Idea Bank, where it made it possible to issue opinions, ideas and suggestions about products and bank services as well as commenting other consumers ideas. As a result it succeeded in building strong and active community, that

at present accounts for about 2200 users and approximately 30 ideas that have already been implemented³⁵.

Taking into consideration the above described forms of presumptive activities in the Polish market of banking services, one may assume that this phenomenon is defined mainly by: adjustment to users requirement, taking advantage of special electronic tools of communication, partnership (consumer – company), building the consumer community and sharing the knowledge and information. Summing up, it has to be mentioned that all the forms of prosumer actions are mainly to be observed in the Internet and are possible thanks to the undeniable development of the new communication and information technology.

5 Summary

Prosumer, a person having a broad knowledge about the products and services and willing to share this knowledge with others, becomes undoubtedly one of the symbols of new consumer attitudes. This consumer is no longer a passive market player, but changes into a partner for companies or service producers; it is a consumer who is decided to take an active part in the market development, finally a consumer that participates in a continuous dialogue with companies.

When trying to define and identify a phenomenon of presumption in the market of banking services, it may be claimed that while getting an access to new technology, the 'old' type of consumer has become a creator of advertising messages and a kind of intermediary in deciding about product and services development. A consumer has become the co-creator by replacing a bank teller and being able to make an online transfer payment individually (self-banking), by the participation in creation of the interface for the a banking product (personalization), and finally by building active communities aiming at sharing and exchanging information about particular financial products and services (crowdsourcing). At the end, technology contributed to the appearance of the modern model of communication, enabling consumer-company interaction and allowing consumer to make use of its natural inclination for commenting. As a result, a new type of consumer in the market of banking services has appeared, which may become an inspiration and the direction for the development of financial services and banking products in the Polish market.

Literature:

1. Bywalec C., *Konsumpcja w teorii i praktyce gospodarowania*, Wydawnictwo Naukowe PWN, Warszawa 2007, ISBN 978-83-01-15300-7.
2. Daszkowska M., *Zarys marketingu usług*, Uniwersytet Gdański, Gdańsk 1993, ISBN 83-7017-450-7.
3. Domańska K., *Kim jest prosument*, Marketing w praktyce, (02) 2009.
4. Gach D., *Pozyskiwanie i wykorzystywanie wiedzy klientów*, E-mentor, (23) 2008.
5. James P., *Customer Self-Service Systems - Innovation in Electronic Banking*, www.gtnews.com.
6. Rogoziński K., *Samoobsługa czy usługa? Albo o wpływie nowoczesnych technologii na usługi*, Materiały Naukowe Katedry Usług Akademii Ekonomicznej w Poznaniu, nr 4, 2001.
7. Rosa G., *Marketing regionalny na rynku usług*, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2005.
8. Rupiński K., *Prosument w procesie planowania marketingowego*, Zeszyty Naukowe Uniwersytetu Szczecińskiego. Relacyjne aspekty zachowań konsumenckich. Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2010.
9. Staniszewski M., *Konsumenci trzeciej fali*, Marketing w praktyce, (02) 2009.
10. Szpunar M., *Współczesny konsument - pasywny, czy aktywny prosument*, Z. Zieliński (red.) Rola informatyki w naukach ekonomicznych i społecznych. Innowacje i implikacje

²⁸ James P., Customer Self-Service Systems - Innovation in Electronic Banking, www.gtnews.com, (30.11.2011).

²⁹ Gach D., op. cit., p. 2.

³⁰ www.mbank.pl (08.03.2011).

³¹ www.bm.bph.pl, system M@kler (30.11.2011).

³² www.fortisbank.pl, www.multibank.pl (30.11.2011).

³³ Akcja „Zbuduj z nami nowy bank” zorganizowana przez Alior Bank, www.aliorbank.pl (30.11.2011).

³⁴ Zółtek D., op. cit., p. 42.

³⁵ www.bzwbk.pl (30.11.2011).

interdyscyplinarne, WSH, Kielce 2009.

11. Tapscott D., Williams A., *Wikinomia. O globalnej współpracy, która zmienia wszystko*, WAiP, Warszawa 2008, ISBN 978-83-60807-23-1.

12. Toffler A., *Trzecia fala*, Wydawnictwo Kurpisz, Poznań 2006, ISBN 83-89738-89-9.

13. Wittich M., *Prosument na granicy dwóch światów*, Marketing w praktyce, (09) 2010.

14. Xie C., Troye S., *The active consumer: conceptual, managerial and methodological challenges of prosumption*, (06) 2010.

15. Zawadzki A., Przewłocka J., *Prosumenci w polskim Internecie*, raport Gemius, 2008, http://pliki.gemius.pl/Raporty/2008/Prosument_raport_Gemius.pdf.

16. Żółtek D., *Marki zbiorowej wyobraźni*, W: Marketing w praktyce, (02) 2009.

17. http://www.tnsglobal.pl/uploads/images/1291/Konsument_Przyszlosci_Marcin_Herrmann.pdf.

18. <http://www.zbp.pl/photo/netbank01.pdf>.

19. www.aliorbank.pl

20. www.bm.bph.pl

21. www.bzwbk.pl

22. www.fortisbank.pl

23. www.mbank.pl

24. www.multibank.pl

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A FEW REMARKS ABOUT GLOBAL GOVERNANCE

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Abstract: The subject of this article is analysis of the global governance issue. This issue is researched with particular interest in the post-Cold War period. The world after the Cold War is no longer bipolar, which allowed to the acceleration of globalization processes. At the same time there were many difficulties in building a new international order. Aim of this study is to show the complexity of these issues. The paper presents the change in the role of the state, as well as analytical and normative understanding of global governance by referring to the two visions of global order - the Commission of Global Governance and the Group of Lisbon.

Keywords: global governance, globalization, state, international order

1 Introduction

The modern world is difficult to clearly identify. It's globalized world, where distances are not relevant, and time and space must be redefined. We use many of the benefits of technology and science, we communicate with each other in English, we buy almost the same products, we invest in foreign stock exchanges and we move freely in the united Europe. We are also citizens of the world. It is impossible not to appreciate the modern open world, especially from the Polish perspective, which even 20 years ago was a country behind the "Iron Curtain". End of the Cold War was not the beginning of the integration of the world, but that the fall of communism collapsed bipolar balance of power that dominated international relations after World War II. Integration existed, but was applied to the world divided in half, to allies and enemies, also the goal of integration was different. The disintegration of the Soviet Union was a start of processes of transformation of Central and Eastern Europe, and very quickly introduced this large group of states in the processes of globalization. Since then, globalization has not had major barriers, and those that existed, began to slowly disappear¹.

The reality, however, was not entirely painless. The transnational actors become more active and the position of the state - the guarantor of security - began to wane. The events of 11th September showed that very clearly. The non-governmental organizations and social movements entered the international relations arena, as well as large corporations, fighting for their interests². In the minds of the inhabitants of the world there were new problems and conflicts emerged - between the various disciplines such as economics and social affairs, trade and development and Third World development and environmental protection. Moreover, there was talk of "global issues" and "global issues" - environmental, economic crisis or the problem of inequality and development³. In this context, the questions about the role of the state began to appear.

2 The role of the state

Emerging and developing phenomenon, creating a new, qualitative features of the international environment, mixing and modifying the old perception of the role of the state. Researchers define the emerging new order as late Westphalia or past Westphalia⁴. Katarzyna Marzęda points six statements for the

characteristics the late Westphalia international order in the context of the problems with the management of a new international order.

- 1) The geographical dispersion of political power between the public and private actors at different levels of government: subnational, national, regional, transnational, global.
- 2) The dispersion of political power in the functional dimension, resulting in deregulation or self-regulation of certain spheres of life.
- 3) More and more resources such as finances, knowledge and technologies that are beyond the control of states. This requires the cooperation of private actors such as corporations, NGOs or academic institutions.
- 4) The national interest of the state becomes identified with its economic interests.
- 5) Functioning of state and the scope of its sovereignty are reassessment in the axiological area.
- 6) There is a replacement for the making and implementation of policy decisions - the hierarchical model is often replaced with dispersal decisions at various levels of management. A constraint is replaced with a voluntary agreement. (Marzęda 2007: 278-279)

State evolves, also changing its functionality. Gregory Gil notes that since the end of the Cold War, the State's resources are being reduced by the process of privatization, outsourcing and decentralization. Privatization is associated with the development of private space, so grassroots and international regulation of markets. Some functions of the state passed into the hands of non-state actors. It is associated with the outsourcing, or subcontracting to specialized entities of the processes necessary for the functioning of the state (in areas such as education, science, culture, the realization of human rights, labour rights, pensions and environmental protection). Apart from the economic field this also applies to security and public order. This leads to the decentralization of the state. Power is passed "up" "down" and to some extent "outside". (Gil 2007: 376-377)

It is also an important element of risk associated with less and less predictable environment. State, trying to minimize them, can either be closed, which in practice is impossible, or resign from parts of their sovereignty by creating supranational institutions. Choosing the first option allows state to keep intact the sovereignty, but at the same time degrades the level of the periphery and receiving the chances of international aid, the benefits of international trade flows of culture, technology, ideas and values⁵. It is hard to be surprised that most of the country, despite the many controversies, consents to the growing integration and interdependence, giving up part of their sovereignty to supranational institutions.

Taking into account these facts, many researchers formulated the thesis of "twilight" or disappearance of the nation state. It is based on the assumption that nation-states waive their sovereignty and lose the power to decide on many issues, which leads to their disappearance. Not without significance is the globalization of culture that is perceived as a threat to national identity.

¹ After the fall of communism, some researchers, such as Francis Fukuyama proclaimed even the "end of history", assuming that nothing important happen, when almost all countries move towards democracy (Fukuyama 2009: 10).

² An important role was played by the global conferences. States have recognized that the scope of their policies is limited, and also realize how big is the role of other non-state subjects. A particularly important role played here the events of Seattle in 1999, the first mass anti-globalists protests.

³ Of course you can not say that about the global problems it is said only since the fall of communism. The interest in global issues emerged at the turn of the 60s and 70. Then, during the emergence of the oil crisis and the collapse of the Bretton Woods system, the increasing global dependence especially began to emerge. Then began to appear the reports of "the Club of Rome", an international scientific organization (think tank). There were also reports issued by the UN (eg report "U Thant" of 1969).

⁴ This is a reference to the Peace of Westphalia, concluded in 1648 in Westphalia. This event has become a symbol of the beginning of the nation state.

⁵ Joseph Stiglitz explains in his book 'Globalization and Its Discontents' activity of the International Monetary Fund. Stiglitz writes that peripheral countries must meet several conditions to be able to benefit from international aid. Often this condition is the requirement of market opening, as for unprepared for this economy is destructive and counterproductive results intended. For example, the IMF's activities in the 90's was based on economic openness forcing poor countries: There was a single prescription. Alternative opinions were not sought. Open, frank discussion was discouraged there was no room for it. Ideology guided policy prescription and countries were expected to follow the IMF guidelines without debate. (Stiglitz 2005: 14)

Kenichi Ohmae and Robert Reich believe that states are transformed into a global system of local government, becoming ineffective instruments of wealth distribution, the creation of the state practically does not depend. Ohmae wrote about erosion and the loss of the economic importance of the state, which is accompanied by the growing number and importance of regional economies, arising within large countries or between small countries. (Zorska 2002: 263). David Lake referring to the concept of sovereignty points to the increasing private power, which limits the authority of states. This is particularly evident in the so-called 'failed states' like Somalia or Afghanistan, but also in countries like the U.S. The state is weak, and its authority is limited and subject to negotiation in each field. (Lake 2009: 24) According to Martin Shaw's view of classic nation-state ended with World War II. The creation of the two great camps during the Cold War caused the reduction of the role of nation-state. The smaller states began to abandon because of its sovereignty to block the western countries, or were incorporated by force in the Soviet bloc. The emergence of transnational institutions, and interdependence within the rivalry created a mutual dependence, and after the Cold War, the great "country western" spread to new regions of the world. (Wnuk-Lipinski 2004: 162-163)

It should be noted that despite the validity of many of the arguments in favour of the twilight of the nation state, there are many reasons for this, that the nation state will survive, albeit in a different shape than the classic approach. Wnuk - Lipinski notes that the state is needed primarily to protect against instability of the world system, manifesting itself, among others through economic crises and armed conflicts. State in the first place will be sought to protect its territory, and only later about the scale of transnational activities. Particular safety - on many levels - often turns out to be higher priority than the interests of all mankind. (Wnuk-Lipinski 2004: 164)

Angela Dylus indicates that despite the crisis state, its future is certain. Universal state projects, which shifted to the nation-state in the shadow is only a utopia (Dylus 2005: 33). Similarly, consider Zygmunt Bauman - state transformations do not lead to their disappearance, but to change their functions. For the good functioning of the state is required to ensure a degree of stability. However, state should not be too strong and should not restrict globalization.

So it is not difficult to see that the replacement of weak states by some kind of territorial legislature and the political world-wide would be detrimental to global markets. (Bauman 2005: 83)

Certain functions of the state took over the international organizations and NGOs, and the market in some parts also is no longer under state control. Despite the changes in state functions can not be said, that it disappears completely or becomes unnecessary. Largely state stability of the international system, and his interests are still an important factor shaping the international order.

3 Global governance

Reflection on the role of the state does not give us a definitive answer to questions about the system of global governance. It is certain that in this system not only take longer part of the state. The increasing role of non-state actors has led to the search for new solutions and create the concept of global governance. By the global governance can be understood all actions which seek to solve global problems, of course, with the participation of new actors, which currently can not be ignored.

The theoretical treatment of these phenomena should be combined with the Washington political scientist James Rosenau and Ernest Otto Czempiel from Frankfurt am Main. In jointly work published *Government without Governance* for the first time they distinguished concept governance and government⁶. The authors introduced the concept governance in terms of various

forms of process control. It also highlights the fact that governance, as opposed to just the government based on law and coercion, is a polycentric. It can be understood rather as a constantly changing network of relationships between actors. (Fel 2006: 185-186)

The introduction of this distinction has contributed to the development of research on global governance. However, there is no agreement as to the meaning of the term. Lawrence Finkelstein, writing about global management even said that *We say 'governance' because we do not really know what to call what is going on.* (Finkelstein 1995: 368). In defining the term global governance first we must stop over the concept of governance. Typology of definitions of this term is dependent on the entity that defines the relationship of this entity and to the international environment. The Commission on Global Governance defines it as the sum of individual and institutional methods, as well as public and private drive and the desire to reconcile conflicting interests and different. (Report of the Commission on Global Governance 1995: 12). The two largest financial institutions, the World Bank and the International Monetary Fund through the concept of management rather from economic and political governance, which is connected with the development and promotion of democracy and transparency. System perspective sees management as a system, an organized institution, that specializes in making decisions on behalf of the entire community (Natorska-Michrowska 2006: 274-275).

This management system has three key roles. First, ensure safety for participants in international relations by sanctioning certain rules and procedures for security against external and internal threats. Secondly, regulates distribution of social goods, the purpose is the management and sustainable distribution of goods, especially basic necessities. Thirdly, it is civic - political functions, which determines organizations of the control environment. (Natorska-Michrowska 2006: 275). It is easily seen that both the security and the problem of distribution of goods as well as the problem of environmental organizations contain a response to the most frequently mentioned "global issues".

In the academic debate, global governance is recognized in two major facets. *Encyclopaedia of Political Science* says that global governance can be a feature of international relations themselves, or be the target to be achieved by actors in international relations (Los-Nowak, Florczak 2010: 203-204). It is in some way consistent with the other division of the analytical and policy approach. In analytical or empirical-descriptive approach, global governance is recognized as the observable phenomenon. Researchers focused on the study and analysis of global structures and different mechanisms of control. The second approach is a prescriptive or politico-strategic approach. The concept is used to determine a particular program, the idea of how political institutions should respond to the declining role of the state and new problems. The proposals are very wide and focus on finding an alternative to control based on free competition by increasing the role of civil society, design of global ethos or world republic (Fel 2006: 185-186).

Discussing the analytical approach should be noted first of all the work of Rosenau, already mentioned above. The author sees the global governance more broadly than just through formal institutions and organizations. He believes that the United Nations system and the state are indeed important, but it is only part of the full image. According to Rosenau global governance is a system of government at all levels, although this is somewhat limited.

(...) global governance is conceived to include systems of rule at all levels of human activity—from the family to the international organization—in which the pursuit of goals through the exercise of control has transnational repercussions. (Rosenau 1995: 13)

This definition contains several important elements: the system of rule, levels of human activity, the goals and transnational repercussions. The first element indicates the mechanisms that regulate the standards, expectations and behaviour in the regulated area. The levels of human activity involve local,

⁶ This is important because it is often mistakenly considered that the management of globalization is equivalent to the creation of a world government.

regional, national, international and supranational control mechanisms. Achievement of objectives is a reference to the fact that something can be included in global governance only if it pursues objectives, which excludes from the global management activities which are undertaken without the intention. The last element - a transnational implications of this narrows, though it seemed fairly broad, definition (Dingwerth, Pattberg 2006: 190).

4 Different global governance visions

The second approach to global governance, is to relate this concept to a political program or strategy that can be applied to solve specific global problems. The authors present their vision, hence the term is called normative.

For some writers, global governance is not so much an empirical or analytical term as it is a political concept that captures a vision of how societies should address the most pressing global problems. (Dingwerth, Pattberg 2006: 193).

An example of a practical approach to global governance is the Commission on Global Governance. It is true that the definition introduced by the Commission is analytic, but its final report is a practical approach. In particular, it is expressed in the words "Call to Action", which is the last chapter of the report "Our global neighbourhood" (Report of the Commission on Global Governance 1995: 380). Key role in this system should have the United Nations and she should become a "center of global governance." But this is not possible in the present form, because the UN is based on the assumptions of the 40s, where the worldwide system was based on countries. The Commission proposes a series of reforms to global security, system management of interdependent economies (for example the Economic Security Council, which would be a coordinating body for the operation of other institutions: the IMF, World Bank and WTO), and the reform of the existing UN bodies (for example, the Trusteeship Council shall exercise control over the world resources). Important elements of these reforms is to strengthen cooperation between governments, more cooperation between state and non-state actors, and of course, greater coordination within the UN system.

Another interesting proposal has been created by the Group of Lisbon in *Limits to competition*. Its members put on the assumption that rich countries should be the precursors of change, asking for the title "limits to competition." The Group of Lisbon provides that states still compete and cooperation is the basis for change. Relying on the concept of social contract, however, seems difficult to achieve, especially when it seems very confusing further role of the UN. The contract is assumed to have a high political will for Japan, USA and Europe, which their expenditures should be largely finance a lot of investment. We do not know what is the role of poorer countries, which would contract this concern. The culture contract is considered a cultural medium and basis for the other contracts, but it seems difficult to conduct in poorer countries, which are consumed internally. In particular, much controversy raises a political contract, which refers to the new body. The role of the UN is virtually ignored, and the sketch of this body is quite unclear. Group also provides strong economic integration of world economy, compared the world economy to the national economy, and it seems that so far-reaching comparison is not justified.

Both of the concepts bring new innovative solutions, more or less controversial and realistic in the current situation of the world. However, it seems that such a comprehensive solution for entering is not working. They can be rather basis for discussion and an impulse to discuss possible changes in the world system. The process of global governance subject to a negotiation between states and other actors, and the same concepts, which are developed by experts, are only sketch proposals for consideration.

An open question is how it will look like in the future governance of globalization and in what direction will it take - whether integration will continue to increase, or rather paradoxes and problems begin to mutually impose on each other and

deepen, causing inhibition of globalization processes. Both of these trends are visible in the modern world. Similarly, the international system is not yet fully defined. So far, the State decided to minor changes - the reform of existing institutions in the United Nations system. United States and Western Europe create themselves as guarantors of security in the world, by fighting against terrorism and to engage in military action in Africa. The balance of the economic system in Europe is very unstable. Environmental protection is a problem that requires long negotiations. The next steps are carried out very slowly. The international organizations and NGOs help mainly Third World countries and the rich countries have a moderate interest in this subject. There is no indication that at least for now there have been significant changes in the international system. There is a need for the respective leaders but above all political will. It also requires major changes in the mentality of the world community and taking into account the growing nationalist tendencies in developed countries and the difficulties arising from changes in Third World countries, it may be a very difficult and long process. Especially now, when the euro zone is in crisis and ideas to return to protectionism are re-awakened.

Literature:

1. BAUMAN, Z. *Globalizacja*. Warszawa: PIW, 2005. 83 p. ISBN: 83-06-02827-9.
2. DINGWERTH, K., PATTBERG, P. *Global Governance as a Perspective on World Politics*. Global Governance 12 (2006). 190, 193 p.
3. DYLUŚ A. *Globalizacja. Refleksje etyczne*. Wrocław: Ossolineum, 2005. 33 p. ISBN: 83-04-04767-5.
4. FEL, S. *Podmioty pozarządowe w global governance*. Zeszyty Naukowe Uniwersytetu Rzeszowskiego, No. 8, Rzeszów: Mitel, 2006. 185-186 p. ISBN 83-60545-09-X.
5. FUKUYAMA, F. *Koniec historii*, Kraków: Wyd. Znak, 2009. ISBN 978-83-240-1218-3.
6. GIL, G. *Ewolucja funkcji państwa w późnowestfalskim ładzie międzynarodowym* [in:] Pietraś M., Marzęda K., *Późnowestfalski ład międzynarodowy*, Lublin: UMCS: 2007. 376-377 p. ISBN: 9788322728925.
7. Group of Lisbon, *Limits to competition*, Cambridge: MIT Press, 1995, ISBN 0262071649.
8. LAKE, D. *Rightful Rules: authority, order and the foundations of global governance*. International Studies Quarterly, no. 54. Published/Hosted by John Wiley and Sons, 2010. ISSN (printed): 0020-8833. ISSN (electronic): 1468-2478. Website: http://polisci.fsu.edu/csdp/documents/Lake_RIGHTFUL_RULES_post_address.pdf.
9. LAWRENCE, F. *What is Global Governance*, [in:] Global Governance 1, no. 3 (1995): 367-372, 368 p.
10. ŁOŚ-NOWAK, T., FLORCZAK A. (red.), *Stosunki międzynarodowe*, [in:] Żmigrodzki M, *Encyklopedia politologii*. Warszawa: Wolters Kluwer Polska Sp. z o.o., 2010. 203-204 p. ISBN: 83-88114-54-9.
11. MARZĘDA, K. (2007), *Zarządzanie wielopoziomowe jako mechanizm funkcjonowania późnowestfalskiego ładu międzynarodowego*. [in:] Pietraś M., Marzęda K. *Późnowestfalski ład międzynarodowy*, Lublin: UMCS: 2007. 278-279 p. ISBN: 9788322728925.
12. NATORSKA-MICHROWSKA, A., *Koncepcja procesów globalnego zarządzania*, [in:] Pietraś M. (red.), *Międzynarodowe stosunki polityczne*, Lublin: UMCS, 2006. 274-276 p. ISBN: 83-227-2579-5.
13. Report of the Commission on Global Governance (1995), *Our Global Neighborhood*, Oxford: Oxford University Press, 1995, ISBN 0-19-827998-1.
14. ROSENAU, J. *Governance In the Twenty-first Century*. Global Governance 1 no. 1 (1995): 13 p.
15. STIGLITZ, J. *Globalizacja*. London, New York: W.W. Norton & Company, 2003. 14 p. ISBN: ISBN 0-393-05124-2.
16. WNUK-LIPIŃSKI, E. *Świat międzepoki, Globalizacja, demokracja, państwo narodowe*. Kraków: Znak, 2004. 162-164 p. ISBN: 83-240-0444-0.
17. ZORSKA, A. (2002), *Ewolucja państwa i jego działalności*, [in:] Liberska B. *Globalizacja. Mechanizmy i wyzwania*,

Warszawa: Polskie Wydawnictwo Ekonomiczne, 2002. ISBN:
83-208-1378-6.

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RESEARCH ON EUROPEAN MICROSTATES IN SOCIAL SCIENCE. SELECTED METHODOLOGICAL AND DEFINITIONAL PROBLEMS

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Abstract: In today's world we have about 200 subjects for which there is no doubt that they are sovereign countries. In the smallest of them live several thousand or even several hundred inhabitants. In modern social science there is no consensus as to what might be called the ministates, microstates, small states and finally dwarf states. Among researchers there is no universally accepted term for 4 microstates lying in Europe: Andorra, Monaco, Liechtenstein and San Marino. Another problem is the Vatican City, which as a specific legal and political solution, according to some, can not be classified into microstates, and others believe is a full member "microstates community." This article aims to systematize terms which relate to small states in Europe.

Keywords: european microstates, ministates, dwarf states, very small states, tiny countries.

Preface

There are four: Andorra, Monaco, Liechtenstein and San Marino. Or maybe even six: Andorra, Monaco, Liechtenstein, San Marino, Malta and Vatican City? Some even claim that the ministates include Luxembourg and Iceland as well. There is no consensus as to which countries should be included among the European microstates. Therefore let's look at the basic determinant - the size of the state. Therefore let's look at the basic determinant - the size of the state. The smallest 10 countries in Europe are in turn: the Vatican City (0.44 sq. km), Monaco (1.95 sq. km), San Marino (61.6 sq. km), Liechtenstein (160 sq. km), Malta (316 sq. km), Andorra (468 sq. km), Luxembourg (2586 sq. km), Montenegro (13812 sq. km), Slovenia (20273 sq. km) and FYR Macedonia (25713 sq. km). If you look at the population, we observe that only part of the previous list of countries recur: the Vatican City (824), San Marino (31,817), Monaco (32,796), Liechtenstein (34,761), Andorra (84,525), Iceland (306,694), Malta (403,532), Luxembourg (474,413), Montenegro (672,180) and Estonia (1,340,122)¹.

In modern political science there is no consensus as to what might be called the ministates, microstates, small states and finally dwarf states. Among researchers there is no universally accepted term for four microstates lying in Europe: Andorra, Monaco, Liechtenstein and San Marino. Another problem is the Vatican City, which as a specific legal and political solution, according to some, can not be classified into microstates, and others believe is a full member "microstates community." This article aims to systematize terms which relate to small states in Europe.

1. Microstates, small states or dwarf states? Definitional problems in social science

In the literature there are many different definitions of small states which we have on the European continent. In English, the most popular are: ministates and microstates, although there are also such as: *village states* and (*very*) *small states*. Polish science theorists of international relations (Janusz Symonides and Dariusz Kondrakiewicz) take direct translation from English, they called *minipaństwa* (ministates) and *mikropaństwa* (microstates)².

¹ CIA The World Factbook, <http://www.cia.gov/library/publications/the-world-factbook/k/goes/>.

² D. Kondrakiewicz, *Państwo*, in: *Międzynarodowe stosunki polityczne*, M. Pietras (ed.), (Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 2006), p. 85; J. Symonides, *Członkostwo*, in: *Organizacja Narodów Zjednoczonych. Bilans i perspektywy*, J. Symonides (ed.), (Fundacja Studiów Międzynarodowych, Wydawnictwo Naukowe Scholar, Warszawa 2006), p. 31.

Such a term (ministrate) was also adopted by Marta A. Sosnowska who analyzed the political system of Monaco. M. A. Sosnowska, *Minipaństwo Monako*, in: *Pierwsza pięćdziesiątka. Małe państwa Europy Środkowo-Wschodniej w Unii Europejskiej*, R.

In the Polish political science literature exist: *państwa karłowate* (dwarf countries), *relikty feudalizmu* (remnants of feudalism), *państwa miniaturowe* (miniature states)³. The first term is probably a consequence of adopting the terminology used such as by Barbara Sikorska, who in her paper of 1971, states the term *dwarf* (państwa karłowate) identified the three entities in Europe: Monaco, San Marino and Liechtenstein, adding due to the nature of contemporary legal situation, including Andorra. The author thus omitted the smallest state in the world - the Vatican⁴. Behind her followed, among others such authors as Mark Śmigasiewicz⁵, Przemysław Osóbka⁶ and Anna Sroka⁷. In turn, Wojciech Jakubowski, Tomasz Słomka, Jacek Wojnicki⁸ and Tadeusz Jasudowicz⁹ argue that the term *państwa karłowate* (dwarf countries) is characterized pejoratively. However, it seems that the term is so deeply enrolled in Polish science that currently its use on the basis of science is free from any negative connotations¹⁰.

Norbert Pap, a Hungarian researcher, uses similar definition: *relict states*. Anglo-Saxon terms researchers use terms: *tiny countries*¹¹ and *pocket states*¹². The United Nations has adopted different definitions. These countries are often described as a *small European states*¹³, or *very small states*¹⁴, but in the latter case in that category (except for Andorra, Monaco, Liechtenstein and San Marino) also Nauru, Timor Leste and Tuvalu. In the same way Christian Frommelt and Sieglinde Gstöhl determine European ministates. Liechtenstein is a very small state according to them, though in the title of their report, they place *very* in brackets¹⁵.

2. Which states are micro- and which are 'normal' states?

How to distinguish the state "normal" on the subject of this article? It is very difficult, that there are no objective criteria to conceptualize this issue. The most common treatment is easy to adopt a certain number of the population as a miniature state border between the states 'normal'. Stanley A. De Smith suggested 150 thousand¹⁶, Patricia Wohlgenuth Blair and Dieter Ehrhardt - 300 thousand¹⁷. Markus René Seiler proposes that the

Zelichowski (ed.), (Instytut Studiów Politycznych Polskiej Akademii Nauk, Warszawa 2010), p. 179.

³ W. Jakubowski, T. Słomka, J. Wojnicki, *Systemy polityczne państw Europy niebędących członkami Unii Europejskiej*, in: *Spółczesność i polityka. Podstawy nauk politycznych*, K. A. Wojtaszczyk, W. Jakubowski (ed.), (Oficyna Wydawnicza ASPRA-JR, Warszawa 2007), p. 567.

⁴ B. Sikorska, *Sytuacja prawnomiędzynarodowa europejskich państw karłowatych*, (Sprawy Międzynarodowe, Warszawa 1971), p. 75.

⁵ M. Śmigasiewicz, *System polityczny Księstwa Liechtenstein*, (Dom Wydawniczy Elipsa, Warszawa 1999), p. 9.

⁶ P. Osóbka, *Systemy konstytucyjne Andory, Liechtensteinu, Monako, San Marino*, (Wydawnictwo Sejmowe, Warszawa 2008), p. 8.

⁷ A. Sroka, *Państwa karłowate a Unia Europejska - kasus Andory*, in: *Pierwsza pięćdziesiątka. Małe państwa Europy Środkowo-Wschodniej w Unii Europejskiej*, R. Zelichowski (ed.), (Instytut Studiów Politycznych Polskiej Akademii Nauk, Warszawa 2010), p. 205.

⁸ W. Jakubowski, T. Słomka, J. Wojnicki, *Systemy polityczne państw...*, op. cit., p. 567.

⁹ T. Jasudowicz, *Przeoczone narodziny państwa-podmiotu. O ewolucji prawnomiędzynarodowego statusu Andory*, (Zeszyty Naukowe WSP. Nauki Prawne, z.L. Olsztyn 1998), p. 155.

¹⁰ In a similar way Przemysław Osóbka expressed. P. Osóbka, *Systemy konstytucyjne Andory...*, op. cit., p. 8.

¹¹ T. M. Eccardt, *Secrets of the Seven Smallest States of Europe: Andorra, Liechtenstein, Luxembourg, Malta, Monaco, San Marino, and Vatican City*, (Hippocrene Books, New York 2005), p. 3.

¹² M. Sobczyński, *Państwa i terytoria zależne. Ujęcie geograficzno-polityczne*, (Wydawnictwo Adam Marszałek, Toruń 2006), p. 178.

¹³ United Nations, *International law as a language for international relations*, (United Nations, The Hague 1996), p. 427.

¹⁴ The United Nations Security Council, *Options for Small States Reykjavik*, (Iceland 16 June 2008, United Nations), p. 2.

¹⁵ Ch. Frommelt, S. Gstöhl, *Liechtenstein and the EEA: the Europeanization of a (very) small state*, (Utvalget for utredning av Norges avtaler med EU, september 2011).

¹⁶ S. A. De Smith, *Microstates and Micronesia: problems of America's Pacific islands and other minute territories*, (University Press, New York 1970), p. 5.

¹⁷ P. W. Blair, *The ministrate dilemma*, (Carnegie Endowment for International Peace, New York 1967), p. 3.; D. Ehrhardt, *Der Begriff des Mikrostaats im Völkerrecht und in der internationalen Ordnung*, (Scientia-Verl., Aalen 1970), p. 102.

term microstates were endowed states with a population of less than 0.5 million inhabitants¹⁸. Jacques Rapoport and William L. Harris set the number at 1 million¹⁹. Similarly, says Michael I. Handel²⁰. H. Armstrong, this criterion increases to 3 million²¹. In turn, Dariusz Kondrakiewicz defined population of ministates of several hundred to several thousand²². It seems that although there is no consensus as to what should be the limit, there is no dispute as to whether it should be based just on the criterion of population and / or size of the territory²³.

In a similar way to proceed Knut Ipsen, who arbitrarily determines that the boundary is to be the Luxembourg, that each country smaller than the Grand Duchy is a microstate. It remains questionable, however, is exactly why this state should be the limit²⁴.

The researchers also highlight the small states as a separate, different from the microstates category includes countries such as Cyprus, Luxembourg and Malta²⁵. They are the smallest EU country, but despite the small population and small area great they deal of fulfillment of the obligations of membership in the EU.

It is obvious that the size of the state does not affect directly the wealth of the population living in that country. William Easterly and Aart Kraay give at this point Liechtenstein and Equatorial Guinea, which are excellent examples of countries very rich and very poor²⁶.

In conclusion, it should be strongly emphasized that the award of small states and microstates of the circle of the "normal" must be based primarily on the criterion of the size of the state, because the omission of this criterion may in effect lead to the classification of each state is smaller than Russia to the category of small states²⁷.

3. Whether microstates are the states?

In science there is no consensus as to which countries should be regarded as sovereign states, and which as such can no longer be considered. There is no doubt that there is incontrovertible and objective criteria which distinguish the state from others. If we believe that sovereign states are those that are members of the United Nations is thus exclude the Vatican, which has observer status and the status of a sovereign state can not be denied.

¹⁸ If we assume such a limit, then the mikropaństw would include: Malta, Iceland, Andorra, Liechtenstein, San Marino, Monaco, Vatican City. Luxembourg, because of population growth in the last few years, and exceeded 0.5 million border residents, would lose the status of microstate. CIA The World Factbook, <https://www.cia.gov/library/publications/the-world-factbook/index.html>; M.-R. Seiler, *Kleinstaaten im Europarat: Fallstudien zu Island, Liechtenstein, Luxemburg, Malta und San Marino*, (Difo-Druck, Bamberg 1995), p. 13.

¹⁹ J. Rapoport, *Small states & territories: status and problem*, (United Nations Institute for Training and Research, New York 1971), p. 30.; W. L. Harris, *Microstates in the United Nations: A Broader Purpose*, (Columbia Journal of Transnational Law 9, 1970), p. 23.

²⁰ M. I. Handel, *Weak states in the international system*, (Routledge, London 1990), p. 47.

²¹ H. Armstrong, R. De Kervenoael, X. Li, R. Read, *A Comparison of the Economic Performance of Different Micro-states and Between Micro-states and Larger Countries*, (World Development, 1998), 639-656.; Ch. Thomas, R. Craigwell, *Revisiting the Effect of Country Size on Taxation in Developing Countries*, (Research Department Central Bank of Barbados and Department of Economics University of the West Indies Cave Hill Campus, 2010), p. 9.

²² D. Kondrakiewicz, *Państwo...*, op. cit., p. 85.

²³ Although one should not forget here the criticism of this approach, who argue that the state numbering 1 million people will be struggling with similar problems as one whose population is several times more, with the only difference that you will experience these problems appropriately intense. D. Vital, *The survival of small states: studies in small power / great power conflict*, (Oxford University Press, London 1971), p. 4-11.

²⁴ K. Ipsen, *Völkerrecht*, (C. H. Beck, München 2004), p. 244.; W. Jakubowski, T. Słomka, J. Wojnicki, *Systemy polityczne państw...*, op. cit., p. 569.

²⁵ G. Rydlowski, *Organizacja przestrzeni publicznej w najmniejszych państwach członkowskich UE*, in: *Małe państwa Europy. Specyfika systemu politycznego i aktywności międzynarodowej*, D. Popławski (ed.), (Oficyna Wydawnicza ASPRA-JR, Warszawa 2009), p. 160.

²⁶ W. Easterly, A. Kraay, *Small States, Small Problems? Income, Growth, and Volatility in Small States*, (The World Bank, Washington 1999), p. 5.

²⁷ An example of such treatment may be even put Sweden (area 449 964 km², 9,415,295 inhabitants) and Finland (area of 338145 km², 5,313,026 inhabitants) as a subject of research in the collective work *Małe państwa Europy. Specyfika systemu politycznego i aktywności międzynarodowej*, D. Popławski (ed.), (Oficyna Wydawnicza ASPRA-JR, Warszawa 2009).

Furthermore, it should be noted that possession of UN member status does not automatically confirm the status of a sovereign state. A perfect example confirming this thesis is the adoption of India (subsidiary of the UK) as a member of this international organization²⁸.

The most common definition of the state presented Georg Jellinek, who pointed out that the total experience must be three factors: population, territory and sovereign power. The Montevideo Convention (1933) pointed out that in addition to the criteria G. Jellinek, the state should have the ability to enter in international relations. So, Andorra, Monaco, Liechtenstein and San Marino have all four characteristics?

- Andorra - has a permanent population, territory, the ability to enter in international relations (mainly via the authorities of the French and Spanish), and the sovereign authority (since 1993, when it adopted the first written in the history of the state constitution, which significantly limited the systemic position of head of state)²⁹;
- Monaco - was the population and territory, the ability to enter in international relations (independently and through the French authorities) and sovereign power;
- Liechtenstein - constant population and territory, the ability to enter in international relations (independently and through the Swiss authorities) and sovereign power;
- San Marino - has the population and territory, the ability to enter in international relations (alone) and the sovereign power.

Should there be there any other criteria expending sovereign state? Often in the literature pointing to the need for international recognition (recognition of any, received all four states) and the ability to enter into interstate relations. All four (Andorra, Liechtenstein, Monaco and San Marino) signed the relevant international agreements with their protectors, as a result of which is Spain, Switzerland, France and Italy have until recently been fully responsible for representing the European microstates in the international area³⁰. However, by appropriate changes in the treaties and the practice of the presence of representatives ministates alone it should be noted a tendency to gradually reduce the role of protectors for governments and diplomatic missions of these four microstates.

Barbara Sikorska in her article *Sytuacja prawnomiędzynarodowa europejskich państw karłowatych* (1971) to the European microstates did not pass the Vatican. Most of the researchers include the smallest country in the world to the group of European ministates. However, given the fact that the Vatican does not meet one of the microstate features which is part of the transfer of competence in the field of foreign policy (in fact exercise that competence alone with the institution of the Holy See, among others Nunciatures apostolic), it can not be regarded as a European ministate.

4. Micronations and quasi-states

So-called micronations are appearing more often in journalism than in political science, quasi-states that are not recognized internationally. The most frequently appearing in the literature examples include primarily:

²⁸ S. T. Stepnicki, *San Marino w stosunkach międzynarodowych*, (Wydawnictwa Akademickie i Profesjonalne, Warszawa 2010), p. 18.

²⁹ Head of state authority is exercised every time by the president of the French Republic *ex officio* and bishop of the diocese of Seo d'Urgell.

³⁰ Marek Sobczyński rightly points out that the same delegation to represent the European microstates for their patrons do not lose their state, because such a decision was taken voluntarily by the microstates. In a similar vein speaks B. Sikorska, who argues that the mere fact of international representation by another state does not affect the nature of the state of the represented entity. M. Sobczyński, *Państwa i terytoria...*, op. cit., p. 259.; B. Sikorska, *Sytuacja prawnomiędzynarodowa...*, op. cit., p. 81.

- Principality of Sealand - founded in 1967, when the abandoned military platform in the North Sea was occupied by Roy Bates, who proclaimed himself prince, Sealand is not recognized as a sovereign state³¹;
- Principality of Hutt River - founded in 1970, when inspired by the activities of Roy Bates, Leonard George Casley decided to announce the secession of 75 km² of land from the Commonwealth of Australia³²;
- Republic of Molossia - founded by Kevin Baugh (in 1999), who announced secession from the United States of America³³;
- Principality of Seborga - located in Italy, near the French border, and in sight of Monaco, founded by Giorgio Carbone.

These entities must be distinguished from a quasi-states in the strict sense. Because if the quasi-state (eg. Northern Cyprus, Somaliland, or even Transnistria) de facto rule over "their" territories, then micronations only declare their reign. Micronations, even after the announcement of their independence, are tolerated by the state in which they are located. Doubts about the existence of any independent micronations disappear when we find that entities are created almost exclusively for commercial and tourism³⁴. The quasi-states are the entities that de facto exercise full authority over "their" territory, but do not meet a single factor, that makes it states - international recognition³⁵.

Remigiusz Mielcarek introduces rare in the Polish scientific literature the term *mikrokraje* (microcountries). The European microcountries recognizes both Andorra and Liechtenstein, as well as micronations (Principality of Seborga) or dependent territories (Crown dependencies), the autonomous regions of sovereign states (Mount Athos), and even quasi-state (Transnistria)³⁶. Lack of both the classification and identification of individual entities vary between sovereign states (such as European microstates) and subsidiaries prevent correct perception of the problem of conceptualization of small states.

5. Relations with 'protectors'

In conclusion, the European ministates should be considered sovereign European states that meet two criteria including: a small territory (less than 500 km²) and a small population (less than 100 thousand.).

In addition, due to the close ties between microstates with its neighbors, mainly for the benefit of transferring their skills in representing them in international forums. You may find that they speak for patrons to forgo the exercise of their sovereignty. Such protector-states for the Principality of Andorra are Spain and France. By 1993 the Principality remained under the authority of feudal co-estate President of France and bishop of Seo d'Urgell³⁷. Only after the adoption of the constitution in 1993, as a result of systemic position reduction of head of state, Andorra became a fully sovereign state. One of the few forms of the French head of state influence on the political life of the Principality is his right of veto over treaties concluded by Andorra.

In the case of Liechtenstein, the early patron was Austria, with which the Principality has concluded an agreement for a customs union in 1852, and since 1880 the Austrian diplomacy was to represent Liechtenstein in its relations with other states. After World War I returned to the Principality in the direction of its other neighbor - Switzerland. Upon termination of the treaty of 1852 by Landtag in 1919, came to an agreement with Switzerland. Since 1921 the representation of Liechtenstein took over the Swiss authorities. In subsequent years, signed the subsequent international agreements (Convention on post, the system of the conclusion of a customs union)³⁸. After World War II was signed Liechtenstein-Swiss agreements include on foreigners³⁹.

France is the protector of Monaco. Since 1865, Principality has a customs union with France, and since 1918 France obtained the right to station troops in Monaco⁴⁰ and approval by the state entered into international agreements (the agreement was later confirmed in 2002 and supplemented by the provisions of the Convention of 2005). Prior to joining the Council of Europe's legal obligation to determine the function of the Principality of the Minister of State (prime minister) of the French and in agreement with the French Government⁴¹. In addition, a change order provisions of the inheritance. Under the legislation before the change, if it came to empty the throne of the Principality, Monaco would become a French protectorate.

San Marino has a specific relationship with his only neighbor - Italian Republic. By the Treaty of 1862 ("Trattato d'Amicizia"), regulates the mutual relations between the neighbors⁴². This system includes a commitment to protect the independence of Italy, San Marino⁴³. After 10 years the system was renewed (1872), and then concluded an agreement for a somewhat different content in 1897. In all these treaties concluded was that the Italian-San Marino relations based on friendship protectionist. Currently, relations between states governed by many bilateral agreements, including the Convention on the friendship and good neighborhood of 31 March 1939. As a result of the discussion around the determination of a protective friendship, which was allegedly called into question the independence and sovereignty of the Republic of San Marino, 10 September 1971 has been changed the wording of Article. A system of 1939, which would lead to the elimination of differences in interpretation⁴⁴.

Protectors on behalf of the ministate's foreign policy and defense policy and also usually carry the right legation, (although it should be emphasized that the example of San Marino has its permanent representative to the Holy See)⁴⁵. This does not mean that microstates are compared to their larger neighbors in hierarchical relationships, because, as we must not forget, ultimately they have the right to terminate contracts with protectors, a right which is an inherent feature of a sovereign state.

Literature:

1. Żelichowski, R., (ed.), *Pierwsza pięćdziesiątka. Małe państwa Europy Środkowo-Wschodniej w Unii Europejskiej*, Warszawa:

³⁸ Ibidem, p. 77.

³⁹ A. Jureczko, E. Wac, *Historia Liechtensteinu*, in: Historia małych krajów Europy, J. Laptos (ed.), (Ossolineum, Wrocław 2007), p. 136-137.

⁴⁰ This was confirmed by the Treaty of 2002. In accordance with Article. 4, the French Republic may, at the request or with the consent of the prince, to enter and stay on the territory of the Principality of Monaco necessary to the security forces of both countries. *Traité destiné à adapter et à confirmer les rapports d'amitié et de coopération entre la République française et la Principauté de Monaco*, art. 4.

⁴¹ At present monarch selects and approves the candidate for Minister of State from among the citizens of Monaco or France. *Convention destinée à adapter et à approfondir la coopération administrative entre la République française et la Principauté de Monaco* 8 novembre 2005, art. 6.

⁴² S. T. Stępnicki, *San Marino w stosunkach...*, op. cit., p. 36-46; The Treaty was subsequently supplemented and amended several times (1897, 1901, 1906, 1907, 1913, 1914, 1920, 1921, 1924).

⁴³ B. Sikorska, *Sytuacja prawnomiędzynarodowa...*, op. cit., p. 78.

⁴⁴ This was accomplished by signing the Additional Protocol by the Italian Minister of Foreign Affairs (Aldo Moro) and Secretary of State for Foreign Affairs of San Marino (Federico Bigi). S. T. Stępnicki, *San Marino w stosunkach...*, op. cit., p. 54.

⁴⁵ J. Sutor, *Prawo dyplomatyczne i konsularne*, (LexisNexis Polska, Warszawa 2000), p. 99-100.

³¹ J. Ryan, G. Dunford, S. Sellars, *Micronations: The Lonely Planet Guide to Home-Made Nations*, (Lonely Planet, 2006), p. 9-11.; E. Kofman, G. Youngs, *Globalization: theory and practice*, (Continuum International Publishing Group, 1996), p. 284-285.

³² N. Onishi, *Rewards for Rebellion: Tiny Nation and Crown for Life*, The New York Times, February 1, 2011.

³³ J. Ryan, G. Dunford, S. Sellars, *Micronations: The Lonely...*, op. cit., p. 61.

³⁴ Residents of Seborga, like other citizens of Italy, they pay taxes that go to Rome.

³⁵ It is noteworthy that almost the norm is that these quasi-states are unable to or provide social benefits and economic welfare or even protect human rights. R. H. Jackson, *Quasi-States: Sovereignty, International Relations And The Third World*, (Cambridge University Press, Cambridge 1993) p. 21.

³⁶ R. Mielcarek, *Mikrokraje Europy*, (Sorus SC, Poznań 2005), p. 15-17.

³⁷ B. Sikorska, *Sytuacja prawnomiędzynarodowa...*, op. cit., p. 88.

Instytut Studiów Politycznych Polskiej Akademii Nauk, 2010, ISBN 978-83-60580-54-7.

2. Wojtaszczyk, K. A., Jakubowski, W., (ed.), *Spółczesność i polityka. Podstawy nauk politycznych*, Warszawa: Oficyna Wydawnicza ASPRA-JR, 2007. ISBN 9788375450125.

3. Sikorska, B., *Sytuacja prawnomiędzynarodowa europejskich państw karlowatych*, Warszawa: Sprawy Międzynarodowe, 1971. ISSN 0038-853X.

4. Śmigasiewicz, M., *System polityczny Księstwa Liechtenstein*, Warszawa: Dom Wydawniczy Elipsa, 1999. ISBN 83-7151-332-1.

5. Osóbka, P., *Systemy konstytucyjne Andory, Liechtensteinu, Monako, San Marino*, Warszawa: Wydawnictwo Sejmowe, 2008. ISBN 978-83-7059-855-6.

6. Eccardt, T. M., *Secrets of the Seven Smallest States of Europe: Andorra, Liechtenstein, Luxembourg, Malta, Monaco, San Marino, and Vatican City*, New York: Hippocrene Books, 2005. ISBN 978-0781810326.

7. Sobczyński, M., *Państwa i terytoria zależne. Ujęcie geograficzno-polityczne*, Toruń: Wydawnictwo Adam Marszałek, 2006. ISBN 978-83-7441-530-9.

8. De Smith, S. A., *Microstates and Micronesia: problems of America's Pacific islands and other minute territories*, New York: University Press, 1970. ISBN 978-0814701188.

9. Ehrhardt, D., *Der Begriff des Mikrostaats im Völkerrecht und in der internationalen Ordnung*, Aalen: Scientia-Verl., 1970, ISBN 9783511006877.

10. Handel, M. I., *Weak states in the international system*, London: Routledge, 1990. ISBN 9780714633855.

11. Vital, D., *The survival of small states: studies in small power/great power conflict*, London: Oxford University Press, 1971, ISBN 9780192153456.

12. Ipsen, K., *Völkerrecht*, München: C. H. Beck, 2004. ISBN 3-40-649636-9

13. Popławski, D., (ed.), *Małe państwa Europy - specyfika systemu politycznego i aktywności międzynarodowej*, Warszawa: Oficyna Wydawnicza ASPRA-JR, 2009. ISBN 978-83-7545-189-4.

14. Stępnicki, S. T., *San Marino w stosunkach międzynarodowych*, Warszawa: Wydawnictwa Akademickie i Profesjonalne, 2010. ISBN 978-83-7644-039-2.

15. Ryan, J., Dunford, G., Sellars, S., *Micronations: The Lonely Planet Guide to Home-Made Nations*, London: Lonely Planet, 2006. ISBN 9781741047301.

16. Kofman, E., Youngs, G., *Globalization: theory and practice*, London: Continuum International Publishing Group, 1996. ISBN 9781855673472.

17. Jackson, R. H., *Quasi-States: Sovereignty, International Relations And The Third World*, Cambridge: Cambridge University Press, 1993. ISBN 978-0521447836.

18. Mielcarek, R., *Mikrokraje Europy*, Poznań: Sorus SC, 2005. ISBN 8389949024.

19. Łaptos, J. (ed.), *Historia małych krajów Europy*, Wrocław: Ossolineum, 2007. ISBN 978-83-04-04937-6.

20. Sutor, J., *Prawo dyplomatyczne i konsularne*, Warszawa: LexisNexis Polska, 2000. ISBN 978-83-7620-440-6.

Primary Paper Section: A

Secondary Paper Section: AD

FACTORS AFFECTING APPROACH TO INTEGRATED LEARNERS WITH SPECIFIC LEARNING DISABILITIES AT PRIMARY SCHOOLS

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This paper is a part of the research project "Specific learning disabilities and behaviour in an inclusive environment of a school" of the Department of Social Studies and Special Education within the Student grant competition 2011 at the Faculty of Education at Technical University in Liberec. The authors are members of the project team.

Abstract: To have an adequate amount of knowledge about specific learning disabilities is one of the important and essential prerequisites of a primary school teacher in the process of inclusive education to cope with positive intervention towards learners with that disorder. The amount of acquired knowledge of each teacher can be affected by some objective and subjective factors that the authors analysed from foreign research. Their influence on the sample of Czech primary school teachers was certified by one of the research undertaken within the faculty project SGS 2011.

Keywords: knowledge, primary school, specific learning disabilities, subjective and objective factors, teacher

1 Introduction

Nowadays it goes without saying that specific learning disabilities (further SLD) develop when an individual's development of abilities and skills is impaired. This group of disorders contains all the learning disabilities arising as a result of partial dysfunctions necessary to acquire various school skills, such as reading, writing, counting, spelling. Specific learning problems can affect both pupils with lower intellectual abilities and also gifted learners. Intelligence of the dyslexics is distributed like in normal population and creates Gaussian curve. However, below-average intelligent learners often have learning difficulties of a complex nature as more intelligent children find a way to compensate their problems more easily, although they are not provided any expert advice. (Flowers et al., 2000, Baum, S. M., Olenchak, F. R., 2002).

To be able to establish a necessary standard to the integrated learners with this disability at a primary school the teachers must have sufficient knowledge about SLD. Only knowledgeable teacher can really understand problems of a dyslexic and therefore have realistic expectations from them which helps the process of inclusive education.

2 Research

The presented research was aimed at determining the factors that affect the extent of teachers' knowledge of SLD and in accordance with knowledge at intervention process of teachers within individual approach to learners with SLD at primary schools. Factors attributable to our consideration were based on analysis of several international studies dealing with the scope of knowledge of teachers about ADHD/ADD (e.g. Graeper, Barker, Terjesen, 2008; Fernández, Mínguez, Casas, 2007). They include:

- sex of the respondent
- educational attainment
- teachers working on lower or higher level of a primary school
- teacher certification
- incidence of SLD in the teacher's family
- experience with teaching learners with SLD longer than 3 years
- interest in further education on this issue
- cooperation with the school's special needs teacher/psychologist
- length of teaching experience

We assumed that the factors affecting knowledge and intervention of teacher will be the same for ADHD/ADD and SLD because of their identical origin.

2.1 Basic information about the research

The aim of the research was to verify the influence of these factors on teachers' knowledge on issues of specific learning disabilities. The research question tried to uncover which of the above-mentioned factors can influence the teachers' gained knowledge on specific learning disabilities. The question was: Which factors influence teachers' knowledge about SLD?

The research itself was carried out in January – February 2011 and was attended by 305 teachers from primary schools with an average age of 41 years. All of them teach learners with a specific learning disability. In the group of respondents women predominated in the ratio 263 : 42. At this stage it was a quota sample, as our own Range of knowledge about SLD was filled in only by teachers who were interested in participating in the research. They filled the research in by email.

The range of knowledge about SLD affected theoretical readiness of the teachers to integrate learners with SLD within inclusive education. There were 36 items, or statements about SLD, which each respondent assessed and chose from three possible answers – the statement is true, the statement is false or I do not know. The answer format allowed to distinguish respondents' knowledge (correctly assessed item) from inaccurate or misunderstood statements (incorrectly assessed item) and the lack of knowledge (I do not know).

To evaluate collected data we used non-parametric rank test to confirm or refute their influence. The factors with the resulting level of probability had values less than 0.05 could be considered statistically significant.

Dispersion characteristics (minimum, maximum, variation range, standard deviation, variance) was performed with using **SPSS 11.0**.

3 Connection between the results of the range of knowledge and given factors

Total score of knowledge about SLD at female respondents is 48.90%, score of men is 38.80%. The difference of the total average score is 10.10. P-value in this table clearly shows that performance is influenced by this factors, female teachers have deeper knowledge of SLD.

- Factor: Sex of the respondent

The range of knowledge about SLD		
sex	MALE	FEMALE
number	42	263
minimum	13.9	8.3
median	38.9	50.0
maximum	75.0	80.6
average	38.8	48.9
Standard deviation	17.5	14.7
Average difference	10.1	
p-value	0.000286	

Table no. 1: Connection between the respondents' knowledge about SLD and the sex of the respondents

- Factor: Educational attainment

Table no. 2 shows that score of the knowledge about SLD of our respondents is not significantly influenced by their highest degree of education (p-value = 0.63567).

The range of knowledge about SLD		
Highest degree of education	Secondary school	University degree
number	44	261
minimum	8.3	13.9
median	48.6	47.2
maximum	69.4	80.6
average	46.3	47.7
Standard deviation	14.2	15.7
Average difference	1.4	
p-value	0.635672	

Table no. 2: Connection between the respondents' knowledge about SLD and educational attainment

If we focus on qualitative analysis of the answers regardless of education, only 12.46% respondents know that good level of phonology is important for successful initial reading of the learner, only 16.07 respondents is aware of the dependency of reading in higher classes on the quality of semantic skills and 13.44% allow the connection between dyslexia and specific language impairment.

- o Factor: Position at school (higher or lower level of a primary school)

For comparison we processed data of respondents teaching at lower and higher level of a primary school.

The range of knowledge about SLD		
Position at school	Lower level	Higher level
number	104	111
minimum	8.3	13.9
median	50.0	44.4
maximum	80.6	77.8
average	48.9	44.6
Standard deviation	13.8	16.6
Average difference	4.3	
p-value	0.049385	

Table no. 3: Connection between the respondents' knowledge about SLD and their position at school

Although there was not demonstrated strong statistical significance, p-value is lower than 0.05. Therefore we can say that there is a difference between knowledge about SLD between both groups of respondents for the benefit of teachers from lower level or a primary school.

- o Factor: Certification

67 (22%) of respondents graduated from special needs, 238 (72%) of respondents graduated from different subjects. Difference between the total score is 14.10, p – value = 0!

The range of knowledge about SLD		
certification	Special needs	other
number	67	228
minimum	30.6	8.3
median	58.3	44.4
maximum	80.6	80.6
average	58.2	44.1
Standard deviation	11.9	15.1
Average difference	14.1	
p-value	0.000000	

Table no. 4: Connection between the respondents' knowledge about SLD and their certification

Graduation from special needs significantly affects quality of knowledge of respondents about SLD. One of the reasons is definitely the fact that curriculum of special needs deal with specific learning disabilities as a separate subject within 2-3 semesters, finished by an examination unlike other teaching certifications when SLD is only a small part within two-semester

block of special needs. Graduates from non-teaching subjects do not have opportunity to touch SLD at all.

- o Factor: Incidence of SLD in the teacher's family

The range of knowledge about SLD		
Relatives with ADHD	YES	NO
number	76	229
minimum	8.3	13.9
median	52.8	47.2
maximum	80.6	80.6
average	51.0	46.3
Standard deviation	14.7	15.6
Average difference	4.6	
p-value	0.018870	

Table no. 5: Connection between the respondents' knowledge about SLD and incidence of SLD in respondent's family

Table no 5 shows that respondents who have a relative with a specific learning disability have also more knowledge about it (p – value = 0.01887).

- o Factor: Experience with teaching learners with SLD longer than 3 years y

The range of knowledge about SLD		
Experience	YES	NO
number	147	158
minimum	16.7	8.3
median	52.8	44.4
maximum	80.6	72.2
average	51.9	43.4
Standard deviation	15.1	14.7
Average difference	8.5	
p-value	0.000004	

Table no. 6: Connection between the respondents' knowledge about SLD and practical experience with teaching learners with SLD

Table no 6 shows significant statistical relevance (p-value = 0.000004). Teachers who have 3 or more years practical experience with teaching learners with SLD achieve better results in this area. It is obvious that direct work with learners with SLD will in many cases lead teachers to the need to find out more information on this matter including monitoring the news.

- o Factor: Interest in further education on this issue

The range of knowledge about SLD		
Interest in further education	yes	no
number	243	62
minimum	8.3	13.9
median	50.0	38.9
maximum	80.6	77.8
average	49.2	40.8
Standard deviation	15.0	15.5
Average difference	8.4	
p-value	0.000085	

Table no. 7: Connection between the respondents' knowledge about SLD and their interest in further education on this issue

Teachers who are interested in further education achieve statistically better results (p-value = 0.000085).

- Factor: Cooperation with the school's special needs teacher/psychologist

The range of knowledge about SLD		
Suggested a learner for examination	yes	no
number	132	173
minimum	13.9	8.3
median	52.8	44.4
maximum	80.6	75.0
average	51.7	44.2
Standard deviation	14.0	15.8
Average difference	7.5	
p-value	0.000058	

Table no. 8: Connection between the respondents' knowledge about SLD and their possibility to cooperate with other experts

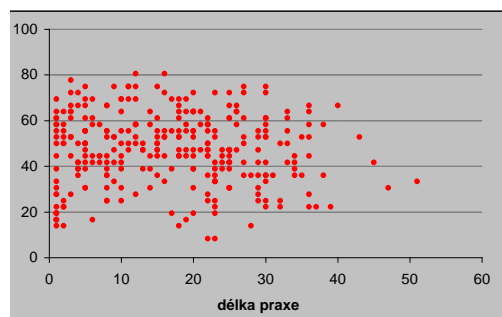
Our group of respondents demonstrated significant statistical dependence of the influence of the teacher's regular cooperation with a school psychologist or special needs teacher within work with learners with SLD ($p\text{-value} = 0.000058$) on the quality of knowledge on this matter. We find it logical – the teachers are under a lot of pressure regarding their work with relationships and their own education towards integrated learners. Cooperation with a school psychologist or special needs teacher gives them personal support. They can safely discuss with this expert facts and information about integration of a particular learner and the specifics of their impairment. School psychologist or special needs teacher can give advice where to find other inspiration for with the learner. This also gently leads them to expansion of their knowledge.

- Factor: Length of teaching experience

Length of experience is indeed a quantitative value, but since it did not demonstrate normal division, its influence on the results was again assessed by the Spearman correlation coefficient (R_s). The test shows how length of experience affects knowledge of respondents about SLD in a positive or negative way. Both Table no 9 and Graph below indicate that length of experience does not affect knowledge about SLD of the respondents. It even seems that the longer the respondent is active in teaching, the lower their theoretical knowledge is. ($R_s = -0.0466$).

The range of knowledge about SLD	
R_s	-0.0466
p-value	0.4193

Table no. 9: Effect of the length of teaching experience on the amount of knowledge about SLD



Graph no 1: Connection between the length of teaching experience and the amount of knowledge about SLD

4 Conclusion

In our research we examined the dependence of certain factors on actual knowledge of primary school teachers about SLD. We have dealt with the issue of SLD because of the increasing number of children with this diagnosis, not only in the Czech Republic. We were looking for an answer to the research question: Which factors influence teachers' knowledge about SLD? Individual factors were set in advance from the analysis of research carried out in the world.

We found that teachers' knowledge about SLD is affected by following factors: sex, special needs education, practical experience with learners with SLD, cooperation with a school psychologist or special needs teacher, interest in further education and SLD in the teacher's family.

No effect was demonstrated in the length of teaching experience and educational attainment in general.

The aim of research at this stage was completed. In the next stage we will continue to explore the knowledge of primary school teachers on appropriate approaches to integrated learners with SLD in the process of inclusion and the actual practical implementation.

Literature:

1. BAUM, S. M., OLENCHAK, F. R. The alphabet children: GT, ADHD, and more. *Exceptionality*, 2002, 10(2), 77-91. ISSN 1532-7035
2. FERNÁNDEZ, S.J., MÍNGUEZ, R.T., CASAS, A.M. Conocimientos, concepciones erróneas y lagunas de los maestros sobre el trastorno por déficit de atención y hiperactividad. *Psicothema*, 2007, 19(4), 585-590. ISSN 0214-9915.
3. FLOWERS, L., MEYER, M., LOVATO, J., WOOD, R. Does third grade discrepancy status predict the course of reading development? *Annals of Dyslexia*, 50, 2000, s. 49 – 71. ISSN 0736-9387
4. GRAEPPER, K.D., BARKER, K.A., TERJESSEN, M.D. Knowledge of ADHD Among Vietnamese and American Teachers. *Collaborative Research Journal of School Psychology* [online]. 2008 [cit. 2011-02-28], s. 18-22.

Primary Paper Section: A

Secondary Paper Section: M, N

ANALYSIS OF TEACHING PROCESS AS A MEANS OF POSSIBILITY TO THE DETECTING INTERCULTURAL COMPETENCE OF PRIMARY SCHOOL TEACHER

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Abstract: The question of whether it is nowadays necessary to educate intercultural is no longer necessary to argue. Changes in society are directly reflected in the educational reality and education systems are forced to respond. Developing of skills needed to implement the methods and principles of intercultural education is both theoretical way, so on the basis of interpersonal interaction. Educational theory is still not able to define the precise application of the concept of intercultural in the educational process. The paper presents the intended research project dealing with the issues of intercultural education. Aim of this paper is to present Bellacks interaction microanalysis as one of the options finding the level of intercultural competence of teachers.

Keywords: analysis of the teaching process, intercultural competence, teacher primary schools, Bellacks interaction microanalysis

1 Introduction

The last twenty years, was for Czech society full of political, economic, legislative and cultural social change. Situation after 1989 radically changed the character of our society in many ways. Opening of borders has fundamentally changed the demographic picture of the population and caused the creation of a multicultural environment. Transformation of the Czech Republic in culturally pluralistic country significantly influenced by the accession to the EU. State of emigration became a state of immigration.

The Czech Republic and the whole Europe are ethnically, religiously, linguistically and culturally complex reality, because of population mobility has become one of the trends. Although majority of society realize the importance of multicultural education, practical experience with us is minimal and we are in a situation where we must search a position of multicultural coexistence. Given the current composition of intercultural competence are considered one of the essential components of professional competence (not only) teacher. Aim of this paper is to introduce the planned research project. Our attention will be focused on the interaction of factors the educational process. We talk about observation of educational reality through interaction Bellacks microanalysis.

Due to the difference in terminology in both Czech and international context, we use the terms multicultural education, multiculturalism, intercultural education, intercultural competence. The term multicultural is used as an indication of coexistence of several cultures side by side, without the implied the context. In this term prevails in schools as an indication of one of the cross-cutting themes of the Framework Educational Programme for Basic Education. The term intercultural is a wider concept and the overarching.

2 Intercultural competence of primary school teacher

Trying to create a more balanced tolerant society reflects into practice through new teaching goals, methods and procedures aimed at acquiring the necessary knowledge and skills. The effective implementation of the objectives we need trained, skilled and educated teachers. Knowledge, skills and habits leading to raising respectful and open society can be described as an intercultural competence. Teachers appear in innovative roles that require the ability to successfully carry out tasks and solve fixed intercultural society. The notion of competence is today can be found in almost all areas of human life. Professional and lay public uses of the term in a different meaning. Specialist competence term refers to the "ability, skill and ability to

successfully implement any actions to address challenges." (Průcha, Walterová, Mareš, 2009) Access to education based on the acquisition of competencies (competency-based approach, CBA), which began to develop early 70th of the 20 century in North America. The general aim of education according to the competencies that an individual was able to handle any situation that will be forced over time to address. The successful, professional and effective education we need to be especially competent teachers. (Scribd, 2009)

Buryánek (2002) defines Intercultural competence as:

- 1.knowledge about different ethnic and cultural groups living in the Czech and European company
- 2.skills to navigate in a culturally pluralistic world, and enjoy intercultural contacts and dialogue to enrich themselves and others
- 3.attitudes of tolerance, respect and openness to different groups and life forms, including awareness of the need for personal involvement

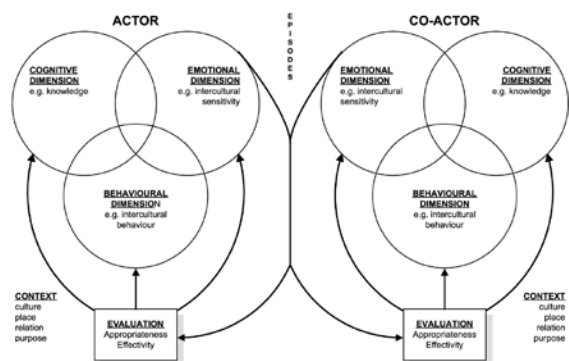
2.1 Options for verification the level of intercultural competence

Extending and transfer of humanistic ethics and worldviews shape assumes full awareness of their own cultural jurisdiction and spiritual values, prejudices and stereotypes. The teacher should know his limits in multicultural expertise and their own emotional reactions in communicating with culturally diverse students. The coexistence of different ethnic groups caused due to various values of the new situation that they can cause problems and conflicts of opinion on the primary school.

Professional requirements for teachers are very varied, because the content of intercultural education is based on the sociological, psychological and culturology base. The requirements in a multicultural environment are reflected in two different ways. Theoretical knowledge must be obtained from several different disciplines such as linguistics, translation, training intercultural communication, intercultural negotiation, legal Comparative, intercultural management, sociology, history, ethnography, psychology, philosophy of man, ethics, law, linguistics, biology, demography, etc.

The second level consists of teaching skills that will enable to choose the methods, procedures, and appropriate measures to implement multicultural education. When integrating multicultural education into teaching is necessary to ensure not only the content and explaining cultural differences (as it happens in many Czech schools), but especially on learning styles, specific communication and social intercourse. It is clear that the verification of the resulting level of intercultural competence of teachers is a complex process that can be implemented only in the educational reality itself (Diagram 1). The rate of learning competency is reflected in the ways of behavior in crisis situations, conflict resolution, responses and other external outputs teacher.

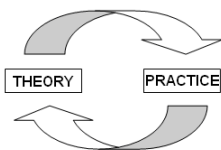
Diagram 1: The process of learning intercultural competence (Graf, 2004)



3 Analysis of Educational Process

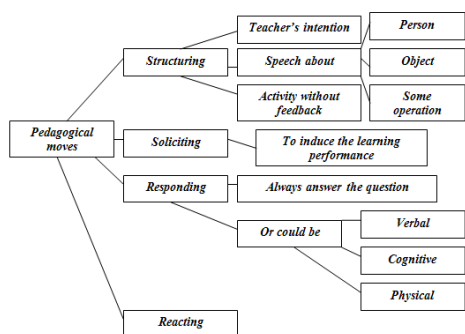
Educational theory is currently still does not have an exact idea about the application of intercultural competence in practice. It presents only an ideal picture of the problems generated by demands of society, which are trying to bring teaching practice. Life around us (and the whole world) is constantly changing. One of the consequences of the changes in the requirements for training and education, this is reflected in practice. Reaction pedagogical theory is an effort to identify and diagnose problems through educational research. Only on the basis of the outputs is then possible to reconstruct the ideal theoretical underpinning of teaching practice that can draw ideas for successful teaching activity (Diagram 2).

Diagram 2: Relationship between pedagogical theory and practice



The principle of cooperation theory and practice has become a key for the research project. The aim of this project is through the analysis of the teaching process determine the actual level of intercultural competence of teachers at Czech primary schools, or other problem situations to their development. During observations of the educational reality of the analysis of the teaching process will be the viewing angle based level of interaction factors educational process. According Tollinger (1971) is happening in the classroom is a special kind of communication. The complex of interactions between teacher and pupil is under the rules that are mutually conditioned. Specific rules and their mutual compliance, are captured in the diagram below.

Diagram 3: The character of interaction between teacher and pupil



The diagram describes the nature of phenomena at different levels. The basic level of educational activity belong structuring, setting requirements, response to requests for feedback and response. In the educational process is to combine the individual level as well as their specific focus. If we want to focus on monitoring the level of intercultural competence of teachers, the research offers a method of observation as an effective way of collecting data, because the resulting level of intercultural competence is evident in educational reality. Standardized behavioral AA Black's technique offers the possibility of detailed and specifically evaluates individual educational processes verifying the level of teacher competence in the field of intercultural education.

4 Bellacs Interaction Microanalysis

In 1966, along with the working team has developed and subsequently verified Colombia University professor Arno A. Bellack special formal language whose use can be relatively objectively capture what is happening in the classroom for teaching and write them simultaneously, almost like an orchestral score (Tollinger, 1971). The introduction presented diagram shows the interaction of coherence factors of teaching. Bellack (as well Tollinger based on its knowledge) this effect calls as a verbal game. The scheme has been formulated on the basis of theoretical input processed by Bellack in publication *The Language of the Classroom*.

Bellack's research technique is focused on verbal expressions of teacher-pupil interaction, and then analyzes the linguistic expressions of teachers and pupils in teaching, because the language as a major communication tool in the classroom. Its publication did not provide a normative guide behavior, but rather a descriptive model of what is actually happening in the classroom. Bellack evaluated separately for both teachers and pupils the basic and the following specific rules for verbal game. Given that Bellack's research was conducted in elementary school, it is possible to compare the results with his own for a more effective evaluation of the shift in the interaction between teacher and pupil. It should be ensured consistently cautious interpretation, because Bellack research sample included both elementary school level (own research applies only to primary school).

In the implementation of research data collection is carried out so that the record lessons recorded on a dictaphone is a verbatim transcript of a special sign language.

The data are processed into the form:
 frequency analysis - what one does and how often and
 sequential analysis - instructional cycle specific to each teacher - the class system.

For the assessment of intercultural competence teacher of this analysis can be used for monitoring purposes:

- how is headed by multicultural education - methods, forms
- the nature of the activity of individual factors of the teaching process - who, what and how...
- and evaluation used methods

5 Discussion

The issue of multicultural education and intercultural education in recent years of emerging topic not only in the positive sense. Cohabitation of people from different parts of the world, different cultures, different socio-cultural background, professing different values with new situations and problems. Every day we are exposed to new supply of information, whose interpretation of ideas and intentions are NOT bases are equal. If we look back into history, we find that he has never been the understanding of self, surroundings and the world around us so problematic.

The specificity of intercultural education is especially critical in the effort to be on their own judgments reliant personality capable to create your own opinion. Intercultural education as such is a means of elimination of both local and global conflicts.

Itself this task goes beyond just teaching. Intercultural competence is today one of the most important part of the professional competence of teachers. Teachers appear in innovative roles that require the ability to successfully implement the tasks set and deal with intercultural education. The teacher himself is forced to respect the different attitudes, beliefs and barriers that affect the behavior of students. You can not assume that through intercultural education can change the behavior and perceptions of people, it is necessary to appeal to moral values and attitudes. Only personal experience can contribute to re-evaluate beliefs and values. Therefore, the overall level of learning intercultural competence take effect immediately in contact. In a real situation it is necessary to use existing knowledge and pedagogical-didactic experience to induce the appropriate educational situation and the choice of effective problem solving.

The detection of intercultural competence are therefore limited primarily factors involved in the educational reality. Now we face the question of choice of methods and focus of research.

Literature:

1. Buryánek, J.: Interkulturní vzdělávání I. Praha: Člověk v tísni, 2002. 102 p. ISBN 80-56899-65-4.
3. Graf, A. Assessing Intercultural Training Designs. In. Journal of European Industrial Training. 2004. Vol. 28 Iss: 2/3/4, pp.199 – 214. ISSN: 0309-0590.
4. Průcha, J.; Walterová, E.; Mareš, J. Pedagogický slovník. 6. Praha: Portál, 2009. 395 s. ISBN 987-80-7367-647-6.
5. Tollinger, D. Bellackova metoda mikroanalýzy a její formální zápis. In Psychológia a patopsychológia dieťaťa. 1971. ISSN 0555-5574.
6. Scribd [online]. Definition of Competency Based Education. 2009. [cit. 2011-10-18]. Dostupné z WWW: <<http://www.scribd.com/doc/19778435/Definition-of-Competency-Based-Education>>.

Primary Paper Section: A**Secondary Paper Section: AM**

THE BREF ANALYSIS OF THE POSSIBILITIES OF TRAINING OF THE CIVIL SERVANTS IN FRANCE

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Abstract: Public administration means, in general conception, the term for the complex of all administrative activities that deal with governing on the central and local level and with the aim of providing of public services to the citizens, or the term for the activity of the organizational units and individuals, by which they are the administrative bodies as the direct bearers of public administration, or official persons performing the tasks of administrative nature. For providing of public administration services to the citizens in quality, it is necessary the continuous formation of the Civil Servants. Like the example analysis it is mentioned the possible training of the Civil Servants in France, from the reason, that French public administration is considered to be the branch, whose employees have the special position for example during the decision-making process.

Keywords: Civil Servants, training, France

1 Public administration in France

What is the term of public administration? They are a lot of definitions originated from various authors, so I would like to mention the concept of some Czech authors¹, in which public administration is seen as material or formal ones. The concept of material one means the complex of all administrative activities that deal with governing on the central and local level and with providing of public services. Public administration in the concept of formal one is seen as the activity of the organizational units and individuals, by which they are the administrative bodies as the direct bearers of public administration, or official persons performing the tasks of administrative nature, or the establishment in the position of the indirect subjects of public administration. Public administration in the concept of material one is also indicated as the organizational concept and public administration in the concept of formal one as the functional concept.

French public administration is considered to be most important branch, because it is proved, that people who have been working in French Civil Service have special position for example in decision-making. From this reason, it is necessary, so that the Civil Servants who work in French public administration should be trained continuously. Many work positions are thus connected with executing of public power. That's why the Civil Servants have specific legal regulation concerning their statute in public administration. They are not subordinated to the Labour Code, but their work position is regulated by special law like by the General Statute of Public Function. This General Statute of Public Function deals with the rights and obligations connected with the Civil Servants and with access to work in public administration.

2 Administrative division of France

2.1 Administrative division

French public administration can be divided into state service and self-government. French central state administration is laid on the principle of specialization. The main institutions within central state administration are the ministries. The number of the ministries is not limited and can be changed during the electoral period. In terms of more effective solving of the problems it leads to deconcentration of the decision-making powers of central bodies and some powers are thus delegated on local self-

governmental territories. The basics of public administration are contained in the French Constitution that says, that territories of the French Republic are municipalities, departements, regions, units with special statute and overseas territories.

2.2 Public function

In France, public administration is divided into three categories². They are state employees, local self-government employees and health service employees. The state employees are the subjects of the individual budget capitol that are usually the same as the ministries. Public function employees are defined³ as public employees who execute their function in accordance with General Statute of Public Administration. These employees are nominated into their function on the unlimited period. These employees have fixed job and are titularized in the hierarchical grade of public administration. And the last, such employees have to be the employees of the public institution. They have the right on the career advancement and on the increasing of their income with regard to the worked years. They have fixed employment and that's why they can enjoy on the regular advancement in the job ladder. The employees inside public administration are independent and they have to serve to the citizens. They have the right to advancement of their career in public administration and they rest on their positions that are not dependent on political power. Due to the long stay in public administration, they can achieve high qualification.

Within career system the employees started their career in initial position and they are educated only for specific position. Their remuneration is set by law. Their knowledge and skills received in the private sector are not granted, only knowledge and skills received in public administration are granted. They have automatic salary achievement according to their worked years. They also have the age limit during starting their career.

But some positions have to be also occupied within merit system. They are some positions whose occupation by people is the right of the minister. Merit system includes the fact, that the positions are occupied in accordance with the qualification and work results of the adepts without regard to their age and to their working in private or public sector. Such employees have concrete position and they can not rely on their advancement.

3 Career and training of the Civil Servants

Training of public administration employees can be provided by the universities or by public administration itself. It can be said, that the universities provide education for the employees in term of their general view who often lack experience and contacts with public administration. The forms of education that come from public administration are often oriented on the practice, but education is very specialized and employees have the problem, when they want to change their position or working branch.

3.1 Career of the employees⁴

Nowadays, Civil Servants are educated in law, but the accent is also posed on knowledge of economic, political and sociological sphere. Each of them is also connected with the task of e-government and modern approaches of the communication to the institutions of public administration, to the citizens and to other subjects. Because of the fact France being the member of the European Union, it is also necessary to train the employees in European affairs, and next in management or in foreign

² See Rouban, L.: *The French civil service*. Paris: Documentation française, 1998. ISBN 2-11-003877-2

Colin, F.: *Accéder à la fonction publique en France*. Pafiz: Galiano, 2004

³ See Aubin, E.: *Droit de la fonction publique*. Pafiz: Galiano, 2004. ISBN 2-84200-603-8

⁴ See Aubin, E.: *Droit de la fonction publique*. Pafiz: Galiano, 2004. ISBN 2-84200-603-8

¹ See for example Pomahač, R., Vidláková, O.: *Veřejná správa*. Praha: C.H. Beck, 2002. ISBN 80-7179-748-0

languages or in e-government questions. It can be said, that working for French Civil Service is very attractive and because of the simplifying access to education many young employees have higher qualification than their post requires.

Typical Civil Servant holds his position in public administration the whole life. He has a motivation for staying in public administration – he has many advantages like the certain employment or good remuneration for his work and the right to the career advancement. The advancement is possible on basis of the years of service or on the basis of abilities of the employee. The employee can receive higher financial remuneration within the same place or can receive higher financial remuneration connected with higher position and more responsibilities. The advancement according to the years of service is possible each 2-3 years, but some exceptions can exist. The advancement according to the abilities is followed by the change of the working position and assignment of higher grade. The advancement register exists and it contains the names of the relevant candidates which are ranged on basis of their abilities and skills. These adepts were evaluated before that by the independent committee. When the post are occupied by the candidates, their order in the register has to be respected. The advancement is not automatic, the adepts have to wait quite for a long time, because it is not possible to create new working position for the purpose of advancement of the employee.

Employees of public (state) administration are divided into corps – they are the groups of employees with the same status, which have the competencies to same grades. The grade means the title that enables to their holders performing the function, which is set for them. The grades are next divided into classes and job ladders. The employees with corps have the right for keeping their grade, but they have not the right for keeping their function. The right for keeping the grade results in certainty of the employment and this factor serves as the motivation element in working in public administration. When the employee starts his career in public administration, he starts in certain corps, within which he tries to develop his career. State administration corps are divided into three categories that represent the different conditions in financial remunerations and in labour recruitment. The employees of category A create the conceptions and managing functions. Some employees do not perform these functions because, although they have required qualification (at least the bachelor study), they have not the work with equivalent job description. The employees of category B do the implementing function and they have to have at least the leaving exam. The employees of category C do least hard works or functions and they have to have the finished compulsory school attendance. The employees of category C mean more than 50 % from all employees in public (state) administration.

In public administration, the employees without corps also exist. They are persons on short-term attachment, contract workers and auxiliary force. These people can be signed on the specific work and then can be sacked much easily. Their content of working can be changed and their financial remuneration can be adapted due to their actual working position.

Training of public administration employees can be provided by the universities or by public administration itself. It can be said, that the universities provide education for the employees in term of their general view who often lack experience and contacts with public administration. The forms of education that come from public administration are often oriented on the practice, but education is very specialized and employees have the problem, when they want to change their position or working branch.

3.2 Training by the universities⁵

⁵ See Institut internationale d'administration publique.: *La formation dans la fonction publique: enjeux et perspectives: actes du premier forum de la fonction publique*. Bratislava: Network of Institutes and Schools of Public Administration in Central and Eastern Europe, 1998. ISBN 80-967616-6-8

The universities usually serve in initial training of future public administration employees. They usually choose the study of law or study of economic and social administration and after it they specialize on administrative law. They can also study Institute of the political studies that belongs to the universities, exception of the Parisian institute, which has its own statute. The duration of the study is about 4-5 years and it serves as good preparation for the application into the functions of public administration or into admission application at National School of Administration⁶. National School of Administration offers for example cycles in initial formation and cycles in continuing formation. Initial formation was in year 2009 about 38 %. The formation for the preparation to the administrative concours was about 19 %.

3.3 Training by the non-university subjects⁷

French public administration wants to train its employees by its own powers. People who are in very high managing position or are expected they will have such position, are trained at National School of Administration. Other managers can achieve relevant education at Regional Institute of Administration. These institutes are subjects to the individual ministries, it depends on the branch of study. In the sphere of the social security, it is possible to choose National School of Social Security. The employees of local self-government are educated by special institutes⁸. They are National centres of territorial public function that provide relevant education for them. People who want to achieve their career in European affairs or within European policy or within European government can study at Centre of European Studies of Strasbourg.

The institutions operating in public administration or local self-government hold for their employees special training courses or they can also finance to them the courses that are not the main specialization within the employees' job. In the same case, when the situation allows it to the employees, the employees can study within their working hours. Nowadays, employees of public administration have the individual right to be trained. It means they have set number of days, in which they can be trained during calendar year. The employees can also apply for financing of other course that can help them in their working. Some employees can be sent on short-term studying attachment to other institution of public administration. The employees are trained the most often in development of specific technical competencies and next in information technologies.

4 Final evaluation

Performing the function in public administration means to acquire high level of knowledge, abilities and skills. For this reason, it is necessary to train continuously all employees in public administration, both in different schools or other institutions. The great potentiality in education can be seen in development of other modern forms of education – like education through information and communication technologies through development of e-government and new forms of communication, i.e. e-learning or m-learning. E-learning or m-learning mean the training of people in any time, in any place, with the suitable place of studying. Such training can be in most cases very effective, because the employee can have the possibility to try, if he understands the study text through the associated tests. The “students” can also receive some certificate on passing their e-learning or m-learning studies to be able to prove their qualification and abilities.

Literature:

⁶ See Internet pages L' École National d'Administration [online]. See <<http://www.ena.fr/>>. [From 12 april 2011]

⁷ See Institut internationale d'administration publique.: *La formation dans la fonction publique: enjeux et perspectives: actes du premier forum de la fonction publique*. Bratislava: Network of Institutes and Schools of Public Administration in Central and Eastern Europe, 1998. ISBN 80-967616-6-8

⁸ See Internet pages of Centre National de la Fonction Publique Territoriale [online]. <<http://www.cnfpt.fr/>>. [From 19 april 2011]

1. Aubin, E.: *Droit de la fonction publique*. Paříž: Galiano, 2004. ISBN 2-84200-603-8
2. Colin, F.: *Acceder à la fonction publique en France*. Paříž: Galiano, 2004
3. Delamarre, M.: *Comprendre l'administration: catégories A et B*. Paris: Documentation française, 2004. ISBN 2-11-005657-6
4. Durand, D.: *Une histoire de la fonction publique territoriale*. Paříž: la Dispue, 2004.
5. Institut internationale d'administration publique: *La formation dans la fonction publique: enjeux et perspectives: actes du premier forum de la fonction publique*. Bratislava: Network of Institutes and Schools of Public Administration in Central and Eastern Europe, 1998. ISBN 80-967616-6-8
6. Pomahač, R., Vidláková, O.: *Veřejná správa*. Praha: C.H. Beck, 2002. ISBN 80-7179-748-0
7. Rouban, L.: *The French civil service*. Paris: Documentation française, 1998. ISBN 2-11-003877-2
8. Internet pages of Centre National de la Fonction Publique Territoriale [online]. <<http://www.cnfpt.fr/>>. [From 19th Avril 2011]
9. Internet pages of L'École National d'Administration [online]. <<http://www.ena.fr/>>. [From 12th Avril 2011]

Primary Paper Section: A

Secondary Paper Section: E, M

OPTIMUM CURRENCY AREA INDEX FOR EU COUNTRIES BEYOND EUROZONE

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Abstract: This paper empirically investigates the readiness of a country to join euro zone according to Eichengreen and Bayoumi's methodology – a measure named optimum currency area (OCA) index. Construction of a OCA index is based on the achievements of OCA theory. Optimum currency area index illustrates the variability of exchange rate which depends on such determinants as: asymmetric shocks, volume of bilateral trade, economy's structure and country size. Analysis concerns EU member states which are not members of euro area. OCA indices are calculated vis-à-vis eurozone and next vis-à-vis Poland. Results show that the best candidates to join euro area are Hungary, United Kingdom and Poland while to countries which are economically similar to Poland we can include Czech Republic, Hungary and Bulgaria.

Keywords: optimum currency area index, monetary integration

1. Introduction

Although the optimum currency area theory (OCA) came under a wave of criticism formulated recently by many economists (Mongelli, 2008; Corsetti, 2008), it is still a benchmark of monetary unification analysis. OCA theory concentrates on indicating factors that can increase the probability of the successful currency area formation. Theory of the optimum currency area consists of two parts: traditional and new theory. Economists who were contributing the development of the theory especially drew the attention to: factor mobility, openness of the economy, similar monetary and fiscal policy, inflation rate convergence and similar structures of the economies. Although the OCA theory underwent many modifications and supplementations, its postulates remained difficult to measure and it was still very hard to move from the theory to empirical work. Eichengreen and Bayoumi (1998) developed a measure which enabled to capture more characteristics of countries to which optimum currency area theory points. They named this measure – the optimum currency area index. In this paper we analyze the readiness of a country to join eurozone according to the value OCA index but calculated for newest data than in the work of Eichengreen and Bayoumi.

2. Optimum Currency Area Theory

The beginning of optimum currency area theory is connected with the discussion on the exchange rate regimes which took place after the failure of Bretton Woods system and dates back to early 1960s. Economists and politicians were looking for the best solutions connected with exchange rates and adjustments under balance of payment disequilibria (Komarek, Cech, Horvath, 2003).

The theory of optimum currency area became one of the main theoretical contributions to monetary unification analysis. Monetary union consists of a group of countries which form homogeneous currency area and have common economic objectives. These characteristics are coherent with a general optimum currency area definition which characterizes such area as a region inside of which circulates one currency or a few currencies but with a fixed exchange rates. This definition was created by Mundell (1961) who pioneered the OCA theory. During the further discussion of optimum currency areas Mundell's definition was modified and supplemented. It was the result of implementing new postulates to the OCA theory (Bień, 1988). Recently, the most popular definition of optimum currency area is based on the cost and benefits analysis of a common currency. This means that countries should form a currency area only when establishing fixed exchange rates leads to economic benefits advantage (Grubel, 1970).

OCA theory development was strictly connected with new postulates of this theory which were introduced by economists analysing monetary unification processes. Since the seminal work of Mundell OCA theory was subsequently contributed mainly by McKinnon (1963), Kenen (1970) and Grubel (1970).

These economist created a set of factors which are indispensable for creating optimum currency area.

Mundell (1960) starts thinking about optimum currency areas from the point of view of processes which could stabilise prices and employment. He postulates that in the economy certain mechanisms should exist which can eliminate the disequilibrium of the balance of payment and unemployment. Mundell claims that these processes should be automatic. He conducts his analysis on the basis of two models of countries with the balance of payment equilibrium and full employment. He checks what will happen if this equilibrium is disturbed. At the same time Mundell assumes that monetary authorities act to prevent inflation what is impossible without an increase in unemployment. He also tries to define the best size of the currency area. Mundell concludes that optimal currency area (area with fixed exchange rates or common currency) should characterise factor mobility.

McKinnon (1963) supplements OCA theory with the analysis of the impact of fiscal and monetary policy. Moreover he also modifies the idea of labour mobility by making the distinction between geographic factor mobility among regions and factor mobility among industries. McKinnon draw attention to the level of economy's openness as a crucial factor in the process of international integration. He adopts a ratio of tradable to non-tradable goods as a simple measure of country's openness. The higher level of this ratio is the more profits can the country gain in case of joining the currency area.

Kenen (1970) is also underlying the significance of the factor mobility adding that there should be occupational labour mobility. Furthermore, he pays the attention to the importance of economy's diversification which should guarantee export and import diversity which reduces terms of trade fluctuations. Kenen postulates the over regional monetary and fiscal policy centralisation.

Grubel's (1970) theory become a link between traditional and new optimum currency area theory. He concentrates on the cost and benefits of the common currency adoption. He claims that a country should join the currency area only when benefits exceed costs what he analyses on the basis of the welfare function. Grubel mentions a number of advantages of monetary integration for example: higher national income, exchange rate risk elimination and price stabilisation.

The beginning of the new OCA theory is dated on 1970s. The attention here is driven to the problems of financial integration, inflation rate convergence and low exchange rate variability (Wojnicka, 2002). Economists postulate that countries which want to form currency area should have similar monetary and fiscal policy while business cycle synchronisation can ensure effective common monetary policy.

3. Optimum Currency Area Index

Optimum currency area theory focuses on determining characteristics which make exchange rates more stable and make the monetary unification more desirable. Unfortunately, great majority of these features are very difficult to measure what cause problems with empirical analysis. This is the reason why most researches limit their empirical investigation only to the verification of one single criterion of the OCA theory. A new approach to this problem was adopted by Eichengreen and Bayoumi (1998). They created a new measure which enabled to capture more characteristics of countries to which optimum currency area theory points. These were: asymmetric disturbances to output, usefulness of money for transactions and trade linkages. Eichengreen and Bayoumi's measure, named optimum currency area index, successfully joined the core implications of both traditional and new OCA theory. What is more this new empirical procedure was based on cross-country data.

Whole investigation concerning OCA index is based on analyzing the variability of exchange rate. The lower it gets the higher probability there is of successful monetary integration from the point of view of optimum currency area theory. As a

key factors which can make the exchange rate more stable authors indicate the lack of asymmetric shocks, high volume of bilateral trade and labour mobility.

Eichengreen and Bayoumi measure asymmetric disturbances as the standard deviation of the change in the logarithm of relative output in the two countries. Hence, if business cycles of a couple of countries are synchronised OCA index should have lower values.

Authors took also under consideration the similarity of countries' economy structures. This measure was a second proxy for the asymmetry of shocks. When the dissimilarity of the commodity composition is larger we can expect stronger impact of industry-specific shocks on the economy.

Furthermore, analysis includes a factor which is a representation of trade linkages between countries. Eichengreen and Bayoumi measure the importance of bilateral trade using the average value of shares of export to partner country in GDP. The more intensive the trade exchange is (what means that economies are more open) the better prospects for future of the currency area.

The last determinant of OCA index value is the size of the country. Eichengreen and Bayoumi assume that smaller countries should benefit more from adopting common currency mainly because of higher stability of this currency.

The estimated equation (1) has a following structure:

$$(1) \quad SD(e_{ij}) = a + \beta_1 SD(\Delta y_i - \Delta y_j) + \beta_2 DISSIM_{ij} + \beta_3 TRADE_{ij} + \beta_4 SIZE_{ij} + \xi_{ij}$$

Where:

$a, \beta_1, \beta_2, \beta_3, \beta_4$ – are the parameters of the model,

$SD(e_{ij})$ – is the standard deviation of the change in the logarithm of the end-year bilateral exchange rate between countries i and j ,

$SD(\Delta y_i - \Delta y_j)$ – is the standard deviation of the difference in the logarithm of real output between countries i and j ,

$DISSIM_{ij}$ – is the sum of the absolute differences in the shares of agricultural, mineral and manufacturing trade in total merchandise trade between countries i and j ,

$TRADE_{ij}$ – is the mean of the ratio of bilateral exports to domestic GDP for the two countries i and j ,

$SIZE_{ij}$ – is the mean of the logarithm of the two GDPs measures in US dollars.

All values of the variables were calculated as averages over the whole sample. Analysis is based on the sample that covers annual data from 1983 to 1992 for 21 countries. Values of OCA indices were calculated vis-à-vis Germany first for the whole sample period and next as a out-of-sample forecasting for the year 1995. According to estimation results which Eichengreen and Bayoumi achieved countries were divided into three groups: prime candidates for European Monetary Union with Germany (first group), those which show respectively high (second group) and low (third group) level of convergence with EMU.

The first group consists of Austria, Belgium, The Netherlands, Ireland and one more country which is not EMU member – Switzerland. Authors express surprise over the absence of France in the first group. Results in the case of France show little convergence despite of relatively low exchange rate variability. However, authors anticipate the crucial role of France in the integration process in Europe and its viability of this enterprise. Eichengreen and Bayoumi are also deeply convinced that Austria and Benelux countries are strongly connected with German economy but they seem to be rather not so sure about the existence of such close relationship between Ireland and Germany.

United Kingdom, Finland, Norway, Denmark and mentioned above France are the members of the second group, described as those who are converging to EMU. Finally, the third group includes Sweden, Italy, Greece, Portugal and Spain. The membership of the last four countries in the third group take on special meaning in the light of current crisis and the financial problems of, so called, PIIGS countries.

Differences between average levels of optimum currency area indices among analyzed countries are mainly determined by relative size (which is rather stable over time) and the intensity of bilateral trade. Therefore, Eichengreen and Bayoumi explain that a very low value of OCA index for France is probably

driven by its considerable size and because it is relatively closed (in comparison with other European countries).

Changes of the OCA index over time are mainly determined by the level of bilateral trade and asymmetry in fluctuations of economic activity. This implies that the policy which aims to increase the intra-European trade is a crucial factor which can stimulate the process of convergence. That is why, according to authors, improving the Single Market (which should promote trade) can lead to successful monetary integration. The second important factor which dominated the value of OCA index is business cycle synchronisation. Consistency of fluctuations of production is very important from the point of view of the effectiveness of common monetary policy.

4. Empirical Results

This paper empirically investigates the readiness of a country to join euro zone according to Eichengreen and Bayoumi's methodology. Analysis is conducted for EU countries which are not members of euro area no matter if they opt-out of joining eurozone or they have not fulfilled Maastricht criteria yet. Indices are calculated first vis-à-vis euro zone as a whole and then vis-à-vis Poland. Such analysis is aimed at pointing out these countries which show the highest level of convergence with euro zone and next those which are economically similar to Poland. Due the fact that Poland is the main point of this analysis it is also investigated how indices for Poland vis-à-vis euro zone were changing over time.

In order to calculate values of optimum currency area indices, parameters of the equation (1) were reestimated. This was necessary because of the willingness to include more actual information. The sample period is from the year 1999 to 2009. However, a few data modification are implemented. Changes goes as follows:

- $DISSIM_{ij}$ – is now the sum of the absolute differences in the shares of agricultural, mineral, services and manufacturing trade in total value added between countries i and j ,

- $TRADE_{ij}$ – is now the mean of the ratio of total exports to domestic GDP for the two countries i and j .

After the first estimation of the coefficients of equation (1) parameter a was not significantly different from zero that is why it was removed and estimation procedure was repeated. The estimation results are presented below.

$$(2) \quad \hat{SD}(e_{ij}) = 0,386 \overset{(2,02)}{SD}(\Delta y_i - \Delta y_j) + 0,111 \overset{(2,47)}{DISSIM}_{ij} - 0,082 \overset{(-2,26)}{TRADE}_{ij} + 0,005 \overset{(3,33)}{SIZE}_{ij}$$

Values in brackets over variables are the t-student statistics. All four variables have anticipated signs and values of t-student test which inform that their coefficients are significantly different from zero on the 95% confidence level.

As it was in the analysis conducted by Eichengreen and Bayoumi, factor which have the strongest influence on OCA index is the consistency of economic activity fluctuations ($SD(\Delta y_i - \Delta y_j)$ variable). The second important factor is here the level of similarity of economic structure ($DISSIM_{ij}$ variable). This means that higher level of these variables (higher asymmetry of business cycles and significant differences in the value added components between countries) leads to a rise of the value of OCA index. In such situation costs of the adoption of common currency and resignation from independent monetary policy can be considerably high.

Equation (2) became a basis for OCA indices calculation for all countries vis-à-vis euro zone as a whole over the whole sample period. Results are presented in figure 1 (countries coloured grey are members of eurozone both in figure 1 and 2).

Figure 1. Values of OCA indices vis-a-vis eurozone as a whole



Source: Author's calculations

Results indicate that the best candidates to join euro zone are: Hungary, United Kingdom and Poland. All these countries have OCA indices lower than 0,08 what suggests that their exchange rates are relatively stable. To the second group we can include Bulgaria, Czech Republic and Denmark. Their OCA indices do not exceed 0,09. According to Eichengreen and Bayoumi nomenclature we can describe these countries as converging the euro area. In the last group we can find: Lithuania, Latvia, Romania and Sweden. OCA indices for these countries are the highest from all analyzed countries and their values are about 0,1.

Similar analysis was conducted in order to measure the values of OCA indices but this time vis-à-vis Poland and again for whole sample period. The findings presented in figure 2 shows that the best candidate countries to form a currency area with Poland are: Czech Republic, Bulgaria and Hungary. Less similar to Poland are: Denmark, Lithuania and Sweden. The most economically different from Poland, taking under consideration values of OCA indices, are Latvia, Romania and United Kingdom.

Figure 2. Values of OCA indices vis-a-vis poland



Source: Author's calculations

The last part of this empirical analysis is measuring OCA indices for Poland vis-à-vis euro zone, but this time not for whole sample period, but for few chosen years. It occurred that the lowest values of OCA index were for the year 2004 and 2005. This were the first two years of polish membership in European Union. OCA indices value were about 0,077. Then the value of

index was gradually increasing to reach 0,09 in 2009. Due to the fact that the value of OCA index is strongly determined by the level of business cycle synchronisation one can assume that these were differences in business fluctuations during recent crisis that led to the deterioration of OCA index. Moreover, Poland and euro zone have different structures of economies. In euro area largest part of the value added is driven from services than it is in Poland where large part of value added comprise of agriculture.

5. Conclusion Remarks

The aim of this paper was to provide the analysis based on Eichengreen and Bayoumi's optimum currency area index which could answer the question: which current EU member states beyond euro area are the best candidates to join eurozone. OCA index seem to be relatively good measure for such investigation because it has a strong theoretical background – it successfully joins the core implications of both traditional and new OCA theory. The empirical investigation was conducted in two directions. Firstly, to measure the values of OCA indices vis-à-vis eurozone. Secondly, to repeat this procedure, but this time in order to calculate the values of OCA indices vis-à-vis Poland.

The results show that the best candidate countries to join eurozone are: Hungary, United Kingdom and Poland. The further findings are that the most similar countries to Poland according to OCA indices are: Czech Republic, Hungary and Bulgaria.

Investigation findings also confirm the thesis that there is a strong influence of the level of business cycle synchronisation and similarity of economies' structures on the monetary integration. That is the economic integration significantly increases country's readiness for joining common currency area.

Literature:

1. Bayoumi, T., Eichengreen, B.: *Ever closer to Haven? An Optimum-Currency-Area Index for European Countries*. 41 *European Economic Review*, 1998. 761-770 pp.
2. Bień, A.: *Optymalny obszar walutowy. Teoria i praktyka*. PWE, Warszawa, 1988.
3. Corsetti, G. A.: *Modern Reconsideration of the Theory of Optimal Currency Areas*. European University Institute Working Paper, February 2008.
4. Grubel, H.G.: *The Theory of Optimum Currency Areas*. Canadian Journal of Economics, 1970.
5. Kenen, P.B.: *The Theory of Optimum Currency Areas: an Electric View*, (in:) Mundell, R.A., Swoboda, J.K. (ed.), *Monetary Problems of the International Economy*. Chicago: Chicago University, 1970.
6. Komarek, L., Cech, Z., Horvath, R.: *Optimum Currency Area Indices – How Close is the Czech Republic to the Eurozone?*. No. 10, Czech National Bank Working Paper, 2003.
7. McKinnon, R.I.: *Optimum Currency Areas*. Vol. 53, No. 4, *American Economic Review*, 1963.
8. Mongelli, F.P.: *European economic and monetary integration and the optimum currency area theory*. No. 302 *European Economy, Economic Papers*, European Commission, 2008.
9. Mundell, R. A.: *Theory of Optimum Currency Areas*. No. IX *American Economic Review* 1961. 657-665 pp.
10. Wojnicka, E.: *Spory wokół teorii optymalnych obszarów walutowych*. No.1, *Ekonomista*, 2002.

Primary Paper Section: A

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DIFFERENCES AND SIMILARITIES IN HUMAN CAPITAL MANAGEMENT IN PRIVATE AND PUBLIC SECTOR ORGANISATION – CASE STUDY FROM POLAND

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Presently, the success of each organisation depends on the effective use of knowledge, skills and on motivation system. It is possible only when the organisation has a necessary at a given time and place human capital and it is able to efficiently manage it [6, 22 p.]. The aim of this article is to present, on the basis of business organisation and public institution, the differences and similarities in the field of human capital management in those entities. The article constitutes an attempt to answer the question concerning the way in which the type of organisation and its connection to public or private sector determines the character of human capital management. The article ends with conclusions in terms of theory and practise and determines the direction for future studies in the field.

Keywords: human capital management, human capital, public administration unit.

Introduction

The growing number of reference studies on different theoretical and empirical aspects of human capital proves its strong position as a strategic resource of every organisation. Since many years the theoreticians and practitioners of management recognise human capital as the leading resource of an organisation which influences its proper functioning. In many publications (among others: T. Schultz, L. Edvinsson, T. A. Stewart, K. E. Sveiby, P.H. Sullivan) it is presented as a basic medium of knowledge and main source of its creation. The Director of the Institute for Intellectual Capital Research N. Bontis believes that human capital is the most important asset in every organisation as it provides products and services to the clients and solves their problems [5, 88 p.]. Despite the fact that the issue of human and intellectual capital management is a topic broadly discussed in the context of building competitive edge of a company [9, 20 p.], the problem of its management in public administration units, government-owned corporations or non – profit organisations is very rarely described. Those organisations also have to treat people as a resource, which has to be managed, as local government units are the ones that handle local problems, know the needs of their communities and are the most common place for people to contact government. Moreover, through public services they perform a significant role in the development of human capital on the macro scale. The superior purpose of the modern administration is to act for the benefit of general public [7, 19 p.]. The studies show that a full transparency of administration and increase of public's life democratization through the growth of general public's participation (especially local one) contributes to the development of social and human capital not only on the level of organisation, but also in the frames of the whole local society. The significant role of human capital in public administration units, as well as in business companies is connected with the necessity to point similarities and differences in the field of human capital management in those organisations in order to specify the conditions for its further development.

In the first part of the article the methodological assumptions in the study were presented. The specific character of case study implementation as a method for empirical research conduction and result analysis was also described.

The remaining part of the article focuses on the thesis that human capital is a strategic resource of each organisation regardless of its nature, i.e. if it belongs to a private or public sector. The presented case study shows the scope in which the organisations subject to the study manage human capital, as well as it describes the conditions for its further development. Moreover, the differences and similarities in the scope of human capital management introduced in those entities were presented.

The constantly changing management environment made business companies and public administration units (public offices) to pay greater attention to human factor. The increasing role of public administration in the structures of public affairs management arises certain questions – do the companies use their human capital in a proper way and what are the mechanisms to stimulate its development? [7, 19 p.].

1 Methodological assumptions in the study

The research was conducted on the basis of two entities operating on the local market. The organisations subject to the study are characterised by a similar scope of their activity and provide public (office) or financial and consulting services (finance agency). They also employ a similar number of people (about 300) and act on the basis of human capital. However, the rules of functioning, sources of financing, organisational structure and the targets of those entities are different and result from the specific character of the sector they operate in. The main factor influencing the development of the entities subject to the study is human capital. In both cases it is connected with non-material character of the provided services. The clients or petitioners evaluate an office/financial institution through the quality of provided services, for which the employees are mainly responsible. In both the office and finance agency the employees are required to have certain skills. The specialist knowledge is not the only requirement and people working in such institutions need to respect the regulations, instructions and the applied rules and norms. Moreover, they have to be disciplined, responsible, diligent, reliable, honest, cautious and have the distance to people and problems, and many more. At the same time they should pay attention to client/petitioner's interest and feel the responsibility for the entrusted financial funds. All of the features mentioned above create the existing or potential human capital of those organisations.

For the purposes of the article the internal documentation of the entities subject to the study was used, as well as results from participant observation (collected during interviews with employees and the management). The result of the study enabled to draw conclusions concerning human capital management in organisations of public and private sector.

In the next part of the study, the starting point for comparison analysis of human capital management made in reference to public and private organisation consists of individual factors influencing the quality of such management in those organisations. This quality is influenced by:

- The character of a source for acquiring human capital in individual organisation,
- Defined targets of human capital management,
- The existing conditions for human capital development,
- Adequate tools for human capital management development.

The presented case study allowed drawing conclusions for the purposes of theory and practice in the field of human capital management in public and private sector organisation.

2 The structure of human capital

Human capital is one of the components of intellectual capital, together with structural capital and client capital. Human capital consists of skills, knowledge and experience of organisation's employees, as well as of the management. However, it is not a simple collection of those components as it also comprises of creativity and innovativeness of teams of co-workers. It is employees who own the capital, not the organisation [3, 46 p.]. This is a very narrow approach towards human capital in the scope of an individual and a company. The review of most accurate definitions of human capital indicates that this term can be considered also for a broader scale. It enables to analyse

resources of knowledge, skills, state of health and vital energy of every person and of a society or a nation as a whole [4, 86 p.].

The human capital mainly consists of [8, 202 p.]:

- competences – it is knowledge, willingness and abilities, skills to use structural capital, interpersonal skills, experience and education,

- relations – ability to share knowledge and trust, which are to create the value for an organisation,

- values – these are concepts distinguishing a unit or group, they influence the selection of tools and effects of actions by determining if a given action is right or wrong

The human capital plays a significant role, which is associated with a person, and with everything which he brings to the organisation as a strategic and non-material component of modern enterprises [9, 12 p.]. However, in reference books we cannot find a uniform, precise term of human capital. It is mainly described as resource of knowledge and skills acquired during the process of education and professional carrier, as well as health and vital energy.

Investments made in the human capital already existing in a company can have two forms. On one hand, they can lead to the development of employees learning process, searching for new solutions and enriching them. On the other hand, they should consist in taking care of employees' general condition, their health and lifestyle. Caring for employee's health has a long-term character [3, 52 p.].

M. Bratnicki [2, 49 p.] notices that human capital (skills, experience, education, attitudes of employees) has to be supported by structural capital (organisation routines included in organisational structure, procedures and organisational culture).

The proper direction for human capital development, as it is presented in the remaining part of the study, requires not only the dynamically operating economic entities, but also public institutions focused on its development in the frames of their structures (on the micro scale), as well as in the frames of all societies. Satisfying cooperation of public administration with other organisations should be done with reference to human capital development on micro and macro scale.

3 Case study description

3.1 Business organisation – finance agency

The finance agency subject to the study has been operating on the local market of financial and investment agencies since 1998, providing services to their clients which include consulting with problem-solving concerning hard and complicated problems in the scope of general investment activity and investment of funds. The basic purpose is to give clients the professional advice, and to help them develop small and medium enterprises.

The strategy of the organisation is based on the following factors:

- to provide high quality of services – it is possible due to constant development of competences and specialists knowledge of the employees,

- innovativeness is a key factor of success understood as the ability to introduce new solutions. It enables to increase efficiency of actions, makes management easier and builds competitive edge,

- specialization allows focusing on the areas which the organisation is most familiar with. Constantly broadened knowledge of specialists, their human capital and continuously improved methodology of actions enables to offer best way of solving problems reported by potential clients.

Personnel strategy is based on the assumption that the employees are a main resource of a company and the development and

competitiveness of all organisations depends on their knowledge, skills, quality of work and engagement. From the established personnel strategy of the described organisation we can see that it makes its competitive edge dependent on the human capital it has. Management of this capital is taken into consideration during strategy preparation, which makes us conclude at the very beginning that the knowledge acquired during working process is used to develop competencies of a team and to increase the value of the whole organisation. The enterprise places emphasis on acquiring knowledge, improving skills and development of competences. Training programmes which result from personnel strategy provide possibility of improving qualifications. The company offers its employees support with education and self-improvement. It monitors employees' careers, their achievements, on basis of which direction for further development is determined. The employees participate in various training, conferences, seminars, symposia and learn at schools of higher education. The management realizes personnel policy which is based on human capital model. The individual sub-systems of human capital management (HCM) are being constantly developed through introduction of new solutions and undertaking actions mainly in the field of motivation, development and evaluation of employee work. The company provides every employee with the opportunity to improve, it stimulates innovativeness and development. Those actions result with employees' satisfaction from work and employment in the company. Consequently, a satisfied and well-motivated employee integrates himself with the organisation, is engaged in solving its problems, which increases the competitiveness of the entity on the constantly changing and sometimes unpredictable market.

Human capital management in the enterprise is demonstrated, among others, through:

- Codification of the process of collecting and sharing knowledge with a use of IT tools, creating expert systems, networks with other entities,
- Rewarding original ideas and possibilities of improvements proposed by employees. Ensuring adequate conditions to develop new, helpful solutions, supporting creativity,
- Comparing own company with competition – it allows to evaluate the value of the possessed knowledge and to find significant distinguishers,
- Adequate usage of knowledge acquired from business environment,
- Immediate undertaking of corrective actions aiming at quick removal of detected inconsistencies,
- Aiming at arrangement of unstructured knowledge, i.e. e-mails, presentations, training materials, documents, multimedia materials,
- Increasing the value of a company through development of non-material assets and creating human capital,
- Adequate coordination of team work,
- Undertaking actions based on knowledge and requiring development of human resources,
- Development of organisational culture supporting creativity and knowledge sharing,
- Propagating company's mission and strategy awareness especially among new employees, as well as undertaking actions aiming at identification of employees with company's targets,
- Determining quality targets, measures and their values, monitoring realization of assumed targets, revising the quality management system by the management,

- Engaging all team in qualitative problem solving – compliance with ISO 9001:2000 and consequential improvement of the introduced quality system,
- Perceiving every employee as company's potential client, rich training system and possibility of following individual career paths, providing employees with the satisfying work environment, stimulating their engagement, and contributing to development and realization of personal targets,
- Stimulating initiatives, innovativeness and independency of personnel, and improvement of team work,
- Safe IT system supporting actions of work teams and cooperation with an expert (tax advisor, legal adviser) – All significant and public knowledge of a company is stored in computer data base, which is subject to periodic check-up aiming at elimination of errors, detecting incomplete or unclear records,
- Influencing employees so they are willing to broaden their knowledge, as well as to share it and use it during performance of their duties – i.e. to base communication within an organisation on mutual trust connected with the feeling of mutual favour, providing one another with substantive support, sharing negative knowledge – resulting from own mistakes,
- Limiting control systems for the benefit of self-control ones, and developing responsibility and trust instead of supervision,
- Fair treatment of employees, perceiving information as a common good.

3.2 Public administration unit

Commune Office (Urząd Gminy) as a public administration unit conducts actions on the territory of one of the communes from Silesian Voivodeship aiming at satisfying collective needs of local community and handling the problems of the individuals.

Ethical code of office employees determines values and ethical rules that the employees have to follow, which are of highest importance during realization of the entrusted tasks. In order to strengthen a positive image of commune local government, it undertakes actions aiming at improving public life's quality and guarantying high level of services provided to local community through observing the following rules by the employees:

- Disinterestedness, impartiality, legality and political indifference – The employees are obliged to follow the rules included in legal regulations in force, and search with due care for solutions which are best for the whole local community. They cannot be vulnerable to pressure which would influence the results of problem-solving.
- Competences, creativity and economy – The office's employee can be mainly characterised by adequate qualifications to realize entrusted tasks, willingness to improve qualifications and skills by oneself and owing to the possibilities provided by the employer. The superior purpose of their actions is supposed to be perspective thinking about the development of the commune and aiming at improving the life of the local society. They take the responsibility for the undertaken actions, as well as they propose new, well-considered and justified solutions, keeping in mind the common good of the commune and office.
- Cooperation, mutual respect and courteousness. Being aware of the fact that the tasks performed by the employees are to satisfy the needs of local community through cooperation of office's units, they should provide environment enabling efficient information flow, exchange of experience and promoting best solutions. The employees should use their best efforts to ensure highest quality of office services, paying attention to explaining even the most complex issues in detail and in a clear and understandable way.

4 Human capital management in the commune office and private enterprise – comparative analysis

The satisfying fact is that, both the management of the office and enterprise subject to the study perceives the significance of employee potential – their skills, qualifications, experience influence the proper functioning (in the case of the enterprise also its survival) on the market. The office having improperly managed human capital will still function, the enterprise not necessarily. This fact broadly explains bigger interest taken in the issue of human capital, but in the private company this capital often decides about its "being still in the business".

In the finance agency subject to the study human capital is treated as a key asset of the enterprise, as its functioning is determined by the level of employee competences, not by the material resources. In the case of the office, human capital management is treated as a way of improvement and a method to increase the quality of services.

On the basis of the below table we can see that the entities subject to the study have different approach towards human capital management. The unit of public administration uses mainly methods proven in practise, does not undertake innovative actions, contrary to the finance agency. The difference in approach results from the specific character of organisation's operation and its environment. In both entities we can see the lack of complex approach towards human capital management. However, the private company has more favourable conditions to its development resulting, among others, from flat organisation structure and character of organisational culture. In the case of traditional organisational structures (i.e. public administration) it is very hard to fulfil the demands of theoreticians in the scope of human capital management.

As it can be seen in table 1 the most common source of acquiring knowledge and creation of human capital, both in the case of finance agency and commune office, are trainings and knowledge of co-workers. However, in the private company trainings are a form of awarding and appreciating an employee by the management. They mainly relate to young employees and are not only professional trainings, but they also place emphasis on the shaping of soft-skills competencies, i.e. improvement of client service or communication within the organisation. There is a possibility of choosing trainings by an employee, which provides the opportunity to adjust them to the requirements of individual post or needs. The training needs are determined by competency model, according to which the company expects high efficiency from all employees, i.e. work of highest quality focused on meeting targets in the determined time.

In the case of the office professional trainings are offered by order from superior authority mainly to employees having longer work record (at least a few years). The subject of trainings is limited to the changes in law regulations. The HR department makes a mistake as they do not let many (almost none) young employees to participate in the trainings. In this way, the management wastes its potential to develop human capital of young but often well-educated employees. Their fresh approach, big determination and willingness to explore, develop and learn is the best asset of private companies which (the example is also the finance agency) assign tasks – pose challenges to low-paid employees in order to find a talented one which can develop to be a successful employee in the future. Contrary to the above, the graduate who starts career in the public office often just helps with administration tasks. The work record, not the individual achievements, determines possible promotion. However, the growing number of trainings every year is a positive symptom. Relatively recently there was a common belief, especially among local government representatives or other decision-makers, that investments in infrastructure should be bigger and made at the cost of investments in human capital [10, 9 p.]. Fortunately, this situation has changed for the better.

Table 1 Comparative analysis of human capital management in public administration unit and finance agency

Public administration unit (public sector)	Finance agency (private sector)
Sources of acquiring knowledge / human capital	
<ul style="list-style-type: none"> - Trainings (substantive character) - Magazines, bulletins and journals, - Purchasing books and software, - Other institutions having similar profile (commune offices) 	<ul style="list-style-type: none"> - Courses and monthly trainings (having substantive character as well as shaping employee soft-skills competencies) - Acquiring knowledge from market participants – other employees, clients, external companies, information from people being outside the organisation, expert knowledge, internal benchmarking, - Broadening knowledge during the work of project, task, and quality teams, - Business practise, documents, reports, descriptions etc. - Magazines, journals, - Practices of competition, - Coaching, mentoring and a so called support discussion (employee evaluation identifying his needs of self-improvement)
Existing conditions for the development of human capital	
<p>Unwillingness to share knowledge caused mainly by:</p> <ul style="list-style-type: none"> - Inadequate organisational culture, - Lack of benefits from sharing knowledge - Lack of mutual trust between co-workers, feeling insecure and convinced of being not good enough, - Fear of losing knowledge, limited trust, interpersonal conflicts - Improper communication between employees, - Insufficient identification of employees with the organisation, 	<p>There are actions taken which encourage and contribute to sharing knowledge between employees, among others, due to:</p> <ul style="list-style-type: none"> - Working in project teams, - Having the system of rewards and benefits as a result of knowledge sharing, - Introducing actions to strengthen the employee attachment to the organisation, participation of employees in the decision-making process,
Communication tools	
<ul style="list-style-type: none"> - Internet, acquired data bases, electronic system of documentation management, - Communication and information flow is done through official documents, - The office distinguishes confidential information and determines access criteria 	<ul style="list-style-type: none"> - Internet, acquired data bases, - Management support systems, expert systems, teleconferences, - Usage of extranet
Demonstration of employee innovativeness and initiative	
<ul style="list-style-type: none"> - Repeating actions and paying attention to routine, reluctance to changes expressed by some employees, - Procedures and routine do not contribute to undertaking innovative actions and to propose new methods of improvements 	<ul style="list-style-type: none"> - Trying to perform work of highest quality, - Giving new ideas
Aims of human capital management	
<ul style="list-style-type: none"> - Elimination of problems connected with organisation management, among others, by improving effectiveness of information management, changing organisational culture and creating the one which would contribute to knowledge sharing 	<ul style="list-style-type: none"> - Change of management style aiming at realization of strategic targets, improvement of information management effectiveness, increasing engagement and satisfaction from work among employees
Applied methods of human capital development	
<ul style="list-style-type: none"> - Employee evaluation system - Uniform character of human capital development methods in respect to all employees 	<ul style="list-style-type: none"> - Motivation systems - Employee evaluation system - Shaping organisation culture which influences creativity, - Diversification of human capital development methods in respect to individual employees

There is a wide range of communication tools which are very beneficial for the office as well as for the finance agency. Unfortunately, the most modern system of information management and flow will not remove the reluctance towards sharing information with co-workers.

The main aim of human capital management in the organisations subject to the study is elimination of problems connected with management. During making analyses in the finance agency, the inefficiency of the introduced management by objectives was determined. It was explained by inability to fully use the knowledge existing in the organisation.

The smaller quality of human capital in the office can result from mentality and attitude towards work inherited from the economic system governed by the state. People got used to paternalism, they do not feel they have to take responsibility for own actions, own success, as they are subject to autocratic mechanisms of management [11, 170 p.]. As long as the office workers will be convinced about the lack of influence of their actions on the quality of functioning of the whole unit, we cannot talk about complex management of human capital in such entities. As M. Woźniak indicates, such syndrome of learnt helplessness becomes a kind of negative human capital which is in opposition to entrepreneurial attitudes. It is often like that that the employees of public administration work as hard as the ones

from the private sector. Their reluctance towards changes and being used to routine is mainly the effect of everyday dealing with strict and old administrative procedures. Moreover, every demonstration of innovativeness, ideas for improvement expressed by young employees is often nipped in the bud by employees having longer work record. In this case the significant potential of human capital is simply wasted. This situation is very disadvantageous as low quality of human capital at the level of public institution conditions the development of this capital in the scope of the whole local community.

The excessive bureaucracy in the office constitutes the main barrier to human capital development. It is expressed, among others, by problems with introduction of innovations, as they are unusual situations and require reorganisation of existing organisational structure; they cause conflicts between experts, for whom knowledge is the authority, and office workers which rely on hierarchy of organisation. A situation in which observance of regulations is more important than meeting targets, which the organisation is supposed to meet due to its mission, does not contribute to the increase of human capital quality. The ability to properly and fully use human potential decides on the success of the assumed plans and projects on the territory of the commune. In order to realize existing strategy and concepts of its development it is necessary to select adequate, competent, and well cooperating work teams.

4.1 Results of comparative analysis

On the basis of the conducted comparative analysis we can observe two different approaches towards human capital management. Its final shape is influenced mainly by: existing organisational structure, type of business activity (sector character), organisational culture, management style and financial abilities. Those factors mainly determine that human capital management is perceived as something necessary in the organisation. The more efficient usage of the existing resources of human capital can be observed in private sector company. In the office there is a necessity to introduce stimuli which would make people express innovative behaviours and create environment appreciating new ideas. Now, it is not enough only to concentrate on repeatable procedures, but it is necessary to be aware of practical significance of knowledge and the things that can be achieved with the use of it. The final shape of human capital management in public administration units requires new approach. The existing one is based on old thinking pattern. The management of public administration has to be aware of the fact that investments made in human capital constitute a condition of economic growth of a region and country. The situation when human capital is underestimated in the office can result in dissatisfaction of employees who only hear how important they are for the organisation, but the practise shows otherwise. Treating employees instrumentally is not good for functioning even of institution which is not focused on generating profit (such as commune office), as it results in low quality of services, and consequently social dissatisfaction. We can presume that after changing the existing and old stereotypical thinking in hierarchical public administration, it will be possible to create human capital management system integrated with work environment. Undoubtedly, the limitations of human capital development result in a way from external conditions, on which the office workers do not have direct influence. The mentioned barrier can be a rate of change or instability of Polish law regulations. However, it cannot constitute justification for the public administration units as the changing law determines also introduction of adaptation actions in the private sector, where they are undertaken much more efficiently. Bad information flow and unnecessary bureaucracy in the office do not contribute to the development of human capital. The communication is also a problematic issue both in relation to client – office worker (resulting from lack of understanding of certain office procedures by the clients), as well as in relation to contacts with other offices. The barriers to communication cause many problems in the scope of providing efficient services to the clients and they result in conflicts within the office, so at the same time they decrease the level of satisfaction from work of

office workers. The management in the public administration unit subject to the study is recommended to undertake actions aiming at shaping team work. It would enable better organisation of communication process and knowledge sharing. Management supporting participation and motivation of employees will allow creating adequate organisational culture which contributes to the development of human capital.

Conclusion

The surrounding world requires more and more from the private business sector and public administration. The effective method to meet those requirements is to introduce a proper system of human capital management. As it can be concluded from the conducted study, the specific character of an organisation and its belonging to public or private sector significantly determines the style of human capital management. Both the private enterprise and public institution believe that it is necessary to manage this capital e.g. in the scope of stimulating innovativeness or improving communication. The actions concerning human capital management introduced in public administration unit and in finance agency are often informal, intuitive and based on experience. However, the experience of the management does not always guarantee success understood as acquiring and having human capital of the highest quality. Therefore, it is necessary to convince the management to undertake actions in the scope of complex management of this capital. The conducted study shows that in a private company we can observe the more systemic approach towards HCM contrary to the one demonstrated in public institution.

Human capital as a crucial resource of every organisation requires special attention. The enterprises which appreciate its significance are characterised by higher level of competitiveness. As it has been proved, the proper approach towards human capital influences the efficiency of functioning also of the public administration units.

The study proposes improvements in the scope of human capital management which in practise should contribute to increase of local government's functioning potential on three levels: effectiveness, economy and benefits. This approach is similar to the model existing in many countries which have introduced a so called new public management. It determines the type of administrative reforms introduced on the basis of mechanisms and instruments characteristic to private sector organisation. Within the frames of this model many concepts have been established, such as managerialism, market-oriented administration, entrepreneurial government or business-like management. Those concepts are connected with a belief that the management tools used in private sector can be successively introduced in the public sector [1, 13-15 p.]. The future studies should aim at searching for stimuli which would make the management from private and public sector express pro-innovative approach in order to create environment that favours the development of human capital.

Literature:

1. Bober J., Mazur S., Turowski B., Zawicki M.: *Rozwój instytucjonalny. Poradnik dla samorządów terytorialnych*. Kraków: MSAP AE w Krakowie, 2004. 13-15 p. ISBN 83-89410-15-X.
2. Bratnicki M.: *Wartościowanie kapitału intelektualnego [w:] Zarządzanie przedsiębiorstwem XXI wieku : wybrane koncepcje i metody*. Miłkuła B., Pietruszka – Ortyl A., Potocki A., Warszawa: Difin, 2002, 49 p. ISBN 83-7251-298-1.
3. Czechowska – Świtaj T.: *Zarządzanie kapitałem intelektualnym w organizacji*. Warszawa: Oficyna Wydawnicza WSM, 2005, 46 – 52 p. ISBN 83-87919-20-9.
4. Domański R., S.: *Kapitał ludzki w rozwoju Polski – uwagi do problemu*. [w:] *Wzrost gospodarczy w Polsce. Perspektywa średniookresowa*. Lipiński J., Orłowski W. Warszawa: Dom Wydawniczy „Bellona”, 2001, 86 p. ISBN 83-11-09340-7.
5. Kasiewicz S., Rogowski W., Kicińska M.: *Kapitał intelektualny: spojrzenie z perspektywy interesariuszy*. Kraków: Oficyna Ekonomiczna, 2006, 88 p. ISBN 83-7484-022-6.

6. Penc J. *Kierowanie w organizacji przyszłości. Zeszyty Naukowe Wyższej Szkoły Zarządzania i Marketingu w Warszawie*, nr 1, 2003, 22 p. ISBN 83-85428-50-3.
7. Piechota G. *Wykorzystanie kapitału ludzkiego w polskiej administracji publicznej*. „Zarządzanie publiczne“ Nr 4 (6) /2008, 19 p. ISSN 1898-3529.
8. Skuza B. *Zarządzanie kapitałem intelektualnym na przykładzie Grupy Skandia*. [w:] *Zarządzanie wiedzą w przedsiębiorstwie*. Wawrzyniak B. (red.) Warszawa: Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarządzania im. L. Koźmińskiego, 2003, 202 p. ISBN 83-86846-93-3.
9. Sokołowska A. *Zarządzanie kapitałem intelektualnym w małym przedsiębiorstwie*. Wrocław: Wydawnictwo Akademii Ekonomicznej we Wrocławiu, 2004, 20 p. ISBN 83-917004-9-6.
10. Wierzbicka I. *Kapitał intelektualny niedoceniane bogactwo regionów. Jego szanse i bariery rozwoju na przykładzie województwa świętokrzyskiego*. *Studia i Materiały Miscellanea Oeconomicae*, Rok 13, Nr 2/2009, Wydział Zarządzania i Administracji Uniwersytetu Humanistyczno – Przyrodniczego w Kielcach, 9 p.
11. Woźniak M. G. *Rozwój kapitału ludzkiego warunkiem bezpieczeństwa ekonomicznego w gospodarce opartej na wiedzy* [w:] *Bezpieczeństwo, administracja i biznes w kontekście członkowską w Unii Europejskiej*. Nogalski B., Tomaszewski J. (red.) Gdynia: Wydawnictwo Wyższej Szkoły Administracji i Biznesu w Gdyni, 2005, 170 p.

Primary Paper Section: A

Secondary Paper Section: E

THE USE OF INTERNAL MARKETING IN PERSONNEL MANAGEMENT OF LOCAL GOVERNMENTS IN SLOVAK REPUBLIC

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Abstract: Internal marketing activities are regarded as an important tool of employee's management in organizations and achievement of personnel management goals, which have been partially used in conditions of local government even though not conceptually worked out. The paper is aimed at definition of internal marketing activities as a component of personnel management in local government in Slovak Republic. In the theoretical part of the paper we define theoretical roots. Consequently we characterize relationship between local government and its employees; we analyze internal marketing activities in Slovak local governments. On the basis of our research we suggest possibilities of conceptual utilization of internal marketing in local government as an organization applying personnel management principles.

Keywords: Communication, employees, internal marketing, motivation, personnel management.

1 Introduction

Employees are a crucial factor that influences quality of production and efficiency, regardless of environment in which the organisation exists and performs. Local government is in comparison with private sector characterised by several specifications in employee's management. While the private sector is oriented on profit, the main goal of local government is to provide balanced and sustainable social-economic development of governed territory. To ensure competences of local government, its employees have to fulfil different qualification assumptions according to their role by the product production. Applying of suitable managerial tools plays also an important role in the relationship to employees. Internal marketing belongs to innovative approaches those deal with management of relationships with employees.

The aim of the paper is to evaluate activities and the use of internal marketing in local governments in Slovak Republic and to identify problem areas. On the basis of investigated theoretical roots we have set the field of research in real conditions of local governments in Slovak Republic. Empirical research was carried out with the use of questionnaire. Respondents of selected researched local governments were heads of municipal authorities (7%), majors (66%) and deputies of majors (18%) and 9% of respondents did not specified their position.

The questionnaires were distributed by interviewers or by electronic mail. The questionnaire contained twelve closed and combined questions, the final part comprised group of identity data of respondents representing local governments. Introductory questions investigated character of relationships between local government and its employees (kind of relationship, importance and quality of relationship for local government and activity of partners in this relationship). Further we studied utilized tools of internal marketing, goals that should be met by their use, frequency and reasons of conflicts in the relation to employees. In our research we verify following hypotheses:

Hypothesis 1: We assume that in relationships between local governments and employees prevails partner relationship.

Hypothesis 2: We assume that education, as an internal marketing activity, is in relation to employees in local government deficiently used.

The statistical sample was defined according quota sampling. We stated two basic quotas – quantitative criteria and region in which is local government located. The sample contains of 100

local governments. It is created from small local governments in the size from 0 to 999 inhabitants (66%), middle sized local governments from 1000 to 4999 inhabitants (28%) and big local governments with more than 5000 inhabitants (6%). Data from questionnaire were worked out by using MS Excel and were evaluated by using statistical program SPSS. We verified the hypothesis by using methods of statistical induction and mean volumes.

2 Internal marketing and basis of its examination as a part of personnel management

Employees perform the crucial task in achieving objectives of an organization and they have eminent influence on quality of production (Payne, 2006). Several authors (Gummeson, 1994; Morgan a Hunt, 1994; Payne, 1996) accentuate, that organization should perceive employees as partners and first customers whose are using its production.

Personnel management deals with theory of employee's management. Its basic task is to motivate employees to participate in raising productivity of organization (Werther, Davis, 1992) as well as local government. Several authors for example Vetráková (1996), Alexy, Antalová (2002) coincided on four basic objectives of personnel management:

1. Sociable objective – to access responsible to social requests and minimize negative influence those requests on organization;
2. Organizational objective – personnel management has to contribute to raising effectiveness of organization. It is an instrument, how to achieve strategic objective of organization.
3. Functional objective – level of services and activities provided by personnel departments should be effective and should achieve standard of organization;
4. Personal objective – to help employees achieve their personal objectives, if these objectives increase contribution of organization.

To achievement of listed objectives scale of personnel activities contributes, which we have tabulated into Figure 1. Personnel management contributes to goodwill creation. It creates good relations with employees, mobilizes them to higher performance, supports their innovative competences and so creates assumption of effective performance of organization.

We agree with assertion of Alexy and Antalová (2002) that synthesis of those activities points on basic activities of personnel management, namely: discover, raise, trainee, evaluate and afford possibilities of personal development.

Internal marketing that contributes to achieve the goals of personnel management is considered to be an important tool of employee's management. It is used partially and not conceptually worked out in local governments. Internal marketing focuses on development of communication, responsibility and putting through of united objectives. The basic task is to build awareness of internal and external customers and to remove functional barriers of effective organization creation. (Michalová, 2004).

There exists several approaches defining content and tasks of internal marketing. Berry (1995) understands internal marketing as satisfaction and motivation of employees caused by satisfying their needs with the objective to reach higher labour productivity. Grönroos (1990) accentuates particularly internal marketing as development of custom oriented behaviour of employees. Narver and Slater (1990) focus mainly on common cooperation among particular departments in organization. Piercy (2002, In: Harwood, Garry, Broderick, 2008) understands internal marketing as a part of strategic planning process oriented on implementation and communication of defined organization's objectives to employees.

Figure 1: Relations between objectives and activities of personnel management

Objectives of personnel management				Activities contributing to achieving of personnel management's objectives
Sociable	Organizational	Functional	Personable	
x				Law-abidingness
x	x			Obligate services
x				Relationship between management and labour union
	x			Planning in personnel sphere
	x			The selection of employees
	x		x	Training and education
	x	x	x	Evaluation of employee's performance
	x	x	x	Employee's placing
	x		x	Motivation of employees
	x		x	Awarding
	x	x	x	Control

Source: authors according to Werther, Davis (1992, p. 25).

From the aspect of relationships with employees as partners, is the essence of internal marketing understanding employees as customers with their own needs and wishes. Therefore we incline to social approach of internal marketing definition according to Vareya a Lewisa (In: Harwood, Garry, Broderick, 2008, s. 120), i.e. internal marketing is an integrated process. That is part of building and development of positive working relations, cooperation and success. Obtaining trust, faithfulness and loyalty of employees as internal customers is the basis of internal marketing as well (Proctor, 2007).

Internal marketing (Ďaďo, Petrovičová, Kostková, 2006, s. 200) enables to provide standard level of provided services, raise productivity and to cut costs, strengthen the mission of a company, strengthen image of an organization in the customer's eyes and to motivate staff in the process of services to increase their professional level.

In larger sense internal marketing includes activities connected with presentation of organization on the market and in narrow sense recruiting with the use of personnel advertising as well, cooperation with institutions on the labour market, sponsorship as well as the use of communication tools (Klimentová, 2008). Implemented internal marketing has to affect in accordance with external marketing, their principles are essentially the same.

Grönroos (In: Janečková, Vašítková, 1999) defines three objectives of internal marketing. General objective means to obtain motivation of employee oriented on customer care and his needs. Strategic objective means to obtain creation of internal environment supporting customer care and development of municipality. Tactical objective represents the participation on the municipal vision, promotion of municipal product including providing services by the municipal authority's employees.

Instruments, with those deals internal marketing, are communication between management and employees, education of employees, improving of customer services, remuneration for individual performance (Diačiková, 2008). It is evident connection to personnel management of an organization. Cooperation of personnel management and marketing management promotes satisfying of customer needs in three basic areas. Personnel management prepares and educates employees according to market segment they are responsible for, to correctly impress on it. Employees are evaluated according to their contribution to objectives of organization. To that should be adjusted their education and evaluation. Personnel management affects critically also by effective cooperation of all functional departments of organization, and so helps to achieve organization's objectives. For employees are determining moments their recruitment, training and education, development of career, remuneration, monitoring and control. Working satisfaction motivates them to better performances and to achieving of organization's objectives.

Janečková a Vašítková (2008) class among basic instruments of internal marketing forms of communication tool public relations

namely confidence building of employees, publishing annual reports, building of corporate culture. Other tools are creating of pleasant working atmosphere and working environment.

Local government should create through internal marketing internal relations with their employees and elected representatives, as primary customers of local government. It uses perfect communication, education of employees and improvement of provided services with oriented on individual approach to customer. Quality of internal structure of organization and quality of municipal management are important aspects as well. Intent of internal marketing is not only to communicate vision, mission and objectives of organization to all bodies and organizations of local government, but also to motivate employees to try to achieve and identify with them and so gradually build and constantly strengthen loyalty of employees. Result of internal marketing in public administration should be an employee who ready responds in contact with customer and diagnose him. He is specialist in his field, is able to solve concrete situation, to understand customer's problems, is communicable, creative and capable and cares for own visage. There are posed different claims on employees in direct contact with customers as well as on managing workers in the sphere of services. Management has to understand internal marketing as a part of management, communication with employees, an important component of services management and creation of corporate culture.

3 Results and discussion

Important aspect of mutual relation between local governments and their employees is definition of character or relation, which we defined in the preliminary question in the questionnaire. According to answers, 82% of local governments perceive their employees as partners, 9% of local governments see them as partners as well as rivals. 9% of respondents did not point their attitude. This implies that 91% of local governments cooperate with their employees on the basis of partnership.

Comparing practical results with theoretical roots we concluded, that representatives of local governments confirm implication of foreign authors (chapter 2). Relationship with employees is understood as partner what creates basic assumption for application tools of internal marketing.

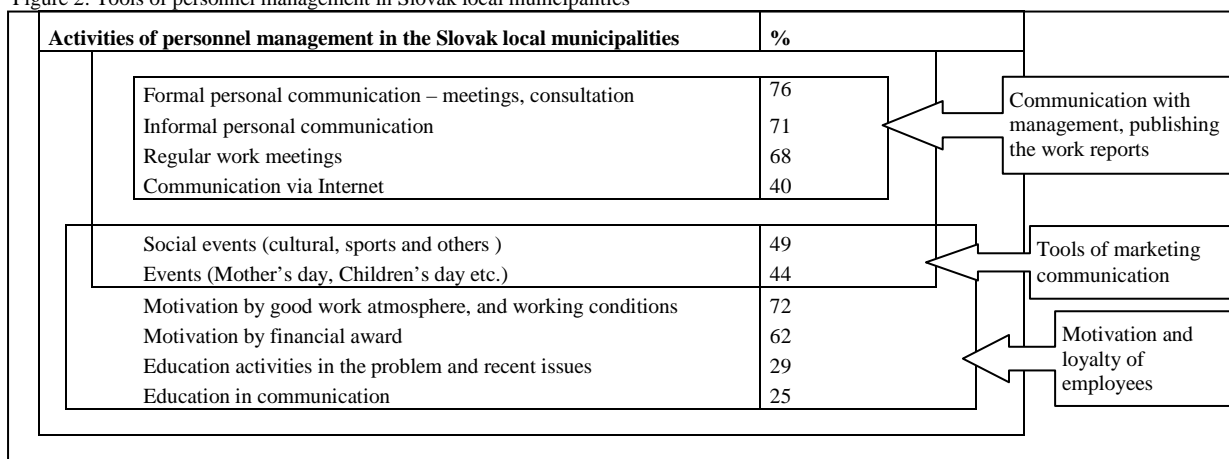
Importance of relation with employees and quality of this relation was valuated on the basis of graphical scale, which was transformed into numerical values in the interval from 1 to 10, where 10 means the most important, the most qualitative and 1 at least qualitative, at least important. Importance is understood as required level of relationships between employee and local government. Quality of relation is understood as real level of relationship in local government. From research results that average importance of relationship with employees is 9.53 point with standard deviation ± 0.99 point. That means that importance of relationship ranges from 8.54 to 10 points. Quality of relationship was evaluated at the level 4.23 point with standard

deviation ± 0.74 point, what means that quality of relationship ranges from 3.49 to 4.97 point. We noticed difference 5.20 point in comparison of listed characters. That means, that however local government realized importance of its employees and their value for local government, real quality of relations with employees indicates the need to focus on building of mentioned relation with more frequent use of till now mentioned tools. The possibility of enhancement relationships with employees in local government is implementation of several tools of management relation with employees from private sector. To those tools belongs building of corporate culture, social programs for employees, possibilities to attend professional and scientific

undertakings, raise qualification, attendance at research activities etc.

Following answers of respondents, we continued in examination of tools, which use local government by building and managing relations with employees. Representatives should mark enumeration of all activities and tools, which they use (i. e. arbitrary number of answers). Answers of respondents are worked out in figure 2 and we divided them according to tools defined by Janečková and Vašítková (2008) and middles by Diačiková (2008).

Figure 2: Tools of personnel management in Slovak local municipalities



Source: Own workmanship of questionnaire research results.

The local self-government builds and maintains the relationships with employees the most by tools of marketing communication. They include various forms of formal, informal communication, communication via Internet. These findings confirm the recommendation of experts (Grönroos, 1990, Gummesson, 2008 Janečková, Vašítková, 2008, Diačiková, 2008), who prefer the application of communication tools in the management of relationships with employees. They stress the use of personal communication, which allows obtaining immediate feedback from employees, as well as the dialogue between management and employees. The survey results show that the representatives of local municipalities are trying to provide sufficient space for mutual communication and exchange of information in the employee's managing.

According to the respondents' answers, electronic communication is inadequate used. However, it brings the possibility of faster, easier, more precise informing between management and employees, as well as employees themselves.

Motivation of employees is developed by local self-governments through creating a good working atmosphere and working conditions, financial award, organizing various social, cultural and sporting events, and through the possibility to be involved in various educational activities

Based on a comparison of theoretical assumptions (2. chapter) and the survey results, we have come to the knowledge that there is a deficit of local governments in real use of employee's training in the current and problem issues, but also in communication. Several authors (Janečková, Vašítková, 1999, Egan 2008, Harwood, Garry, Broderick, 2008) stress the role of events in relationships and loyalty building. Because the fact, that organizing various social, sports and cultural activities is used only in 49% (44%) of local self-governments and there absents realization of "team building" activities, we can conclude that the effort to build loyalty and good relations is insufficient in local municipalities. Moreover, we found by the primary research that in real terms, it is not possible to separate the tools,

because they interrelate. It makes possible to achieve a synergistic effect of their application.

We examined the objectives of the personnel management. We compared the results with the aims of internal marketing defined by Grönroos (In Janečková, Vašítková, 1999). Respondents could mark any number of answers (Figure 3).

The local government builds relationships with their employees in order to achieve their satisfaction, awareness, create a healthy work environment, improve of their work, raise their educational level, support the application of theoretical knowledge in practice, but also to involve them in solving municipal problems and issues of further local development. The relationship between local self-government and employees is also supported by legislation, e.g. Labour Code, Law on the work in the public interest and so on.

The local municipalities in Slovakia contribute by their staff management activities to achieve the general objective of internal marketing defined by Grönroos, which is to satisfy the needs and provide customer care by meeting the needs of the employee. The fulfilling strategic objectives (i.e. building internal environment) is only partial. The share of local self-governments, which seek to achieve it through its activities, is lower. The most critical situation is in achieving a tactical objective. Only half of the local self-governments support by cooperation with its employees the development of municipality and its activities, common solving the municipal problems, promotion etc. In view of these facts, the absence of local self-government effort to gain loyalty of the employees through their participation in local development and the development of common activities was confirmed again. It is necessary for fulfilling the general objective of internal marketing at a higher level firstly to achieve the satisfaction of own staff by the incentives of their working environment. Their satisfaction is then transformed into customer satisfaction. The objectives aimed at creating good working conditions for

Figure 3: The objectives of personnel management in Slovak local government

The objectives of personnel management in local government		Rate %
General aim	Creating a healthy working environment	68
	Satisfaction	60
	Provision of information	54
	Law obligation	44
	Ensuring effective cooperation	39
Strategic aim	Increasing the quality of work	59
	Application of theoretical knowledge in practice	52
	Increasing the educational level	46
	Providing better quality of public services	43
	Easier implementation of new management practices in municipality	39
Tactical aim	Improving living standards in municipality	29
	Development of municipality and its activities	46
	Help to solve the problems in the municipality	38
	Building a good image of the municipality	37
	Promotion of municipality	34
	Development of common activities	35

Source: Own workmanship of questionnaire research results.

employees belong to the strategic objective of internal marketing and in our case, they are not met, the final level of satisfaction of employees and customers is doubt.

In evaluation of relationship activity between local self-governments and employees, respondents identified which partner is more active. The activity in developing and managing relationships with employees is equally divided between both parties (self-government and employee) in 81% self-governments. 14% of municipalities must implement more activities as employees. Employees are more active in 2% of municipalities. Only employees are active in 1% of self-government and 2% of self-governments did not answer the question. The fact that in more than two-thirds of surveyed local self-governments is activity divided proportionally creates the conditions for the development of mutual communication, sufficient information and space for mutual debate in solving working problems. Utilization rate of that activity is not transformed sufficiently in achieving objectives of internal marketing, which we describe in figure 3.

The important issue is also to identify the frequency and causes of conflicts in the researched relationships. Up to 28% of representatives of local self-governments reported the occasional occurrence of conflict in relation with the employees. Only single conflict with staff was occurred in 29% of municipalities. 36% of self-governments have no conflicts in relations with employee. The repeated conflicts have occurred in 4% of municipalities and 3% of local self-governments did not respond. Overview of conflict causes is shown in figure 4. There was not a limited number of responses

Figure 4: Reasons for conflicts of local self-government and its employees

Reasons for conflicts with employees	Rate in %
Lack of financial funds	20
Different goals and priorities	12
Bureaucracy	7
Lack of legislation	7
No qualification	7
Lack of awareness	6

Source: Own workmanship of questionnaire research results.

The most serious problems in relationships with employees are lack of funds for their remuneration and inconsistencies in the objectives and priorities. Other categories of conflicts appeared in respondents' answers less often. For example: the bureaucracy, lack of awareness, and no qualification. Based on the results of the analysis, we consider positively that the relationship between management and local government's employees is less prone to conflict. Disputes do not impair significantly the operation and activities of local self-

governments in Slovakia. The possibilities of conflict's prevention can be seen in the targeted application of internal marketing to relationships with employees that lacks in the local municipalities of SR as shown our research outputs.

4 Conclusions

Internal marketing has become an important part of personnel management in business practice and partly is implemented also in the activities of local self-governments. His activities and methods are interconnected and it makes possible to achieve synergies in their implementation.

Before making the questionnaire survey we identified two hypotheses. The first hypothesis is: the employees in the surveyed municipalities are perceived by the self-government's representatives mostly as partners (91% of local authorities). We verified it by binomial test (significance level 0.05). The results of the test are presented in the figure 5 (part A). By the evaluation of the test, we found that the partnership with employees prevails in relations between local self-governments and employees. Hypothesis 1 is confirmed.

The local municipalities in Slovak Republic use different tools in managing of their employees. In comparison with the theoretical knowledge and outcome of the survey, the local self-governments in Slovakia emphasize various forms of personal communication. Data about the management tools in the relationships with employees we used to verify the second hypothesis: the education as an activity of internal marketing is used in local self-governments in relationship with employees insufficient. By a binomial test (significance level 0.05), we confirmed the hypothesis. In defined activities, we identified space for improvement and better meeting the needs of local self-government's employees (figure 5, part B).

To improve the using of internal marketing tools in local municipalities is necessary:

- to provide wider opportunities for further education of employees, which build their loyalty to the self-government and increase their qualifications, precise their skills and abilities,
- to expand the use of electronic communication between management and employees and between employees themselves. The basic premise is a functioning information system in local municipalities, whose improvement should be an integral part of the computerization of public administration,
- to foster loyalty to the organization by organizing various social, cultural or sports events with the formal and informal nature.

Figure 5: Binomial tests

Part A

The nature of relationships		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)/2
Employees of local municipality	answer	partners	82	0,90	0,50	0,000	0,000	0,000
	answer	other answers	9	0,10	-	-	-	-
	Total	-	91	1,00	-	-	-	-

Part B

The use of education	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)/2
yes	37	0,37	0,50	0,012a	0,012	0,006
no	63	0,63	-	-	-	-
-	100	1,00	-	-	-	-

Source: Own workmanship of questionnaire research results.

The general objective of internal marketing is a satisfied employee and then a satisfied customer, which is also confirmed by the local self-government because the effort of local self-government is to provide to the employee – information, satisfaction, good working environment. Subsequently, the activities of local self-governments focus on quality of their work, which translates into provided products. The last group of objectives achieved by the government at least, is the development of municipality, building its image, problem-solving. For the proper application of internal marketing, local self-governments should follow all these objectives in the same extent, what lacks in Slovak local municipalities. The local self-governments should focus more on creating incentives for good working environment for employees (offices, their equipment, supporting effort to implement innovative practices, staff training, etc.), as well as their involvement in the creation of programs, plans and development strategies of local municipality, problem solving etc. Only by these activities, it is possible to support the sense of employee loyalty to local self-government, which is important for the organization's image and quality of products.

The activity in the relationship between local self-governments and employees is divided proportionally. These relationships belong to the less conflicted. The most common cause of conflicts between management and employees of local self-governments is the lack of funds. This problem can be solved only partially, that is why the local government should implement other motivational tools, such as creating a nice atmosphere in the working environment, moral evaluation of employees and others. The problem in these relationships is a poor communication between management and employees, which is partly due to inconsistencies in the objectives and priorities of employees and local governments.

Local government should build loyal employees; gain their trust by financially less demanding motivation tools and to see them as first customers and partners. A good cooperation between local self-government and its employees are becoming crucial competitive advantage in local municipality. Nowadays, when there are increasing attempts to implement practices from the business sector in public administration, the importance of internal marketing in the public sector will grow.

Literature:

1. Alexy, J., Antalová, M. *Trh práce a manažment ľudských zdrojov*. Bratislava: Ekonóm, 2002. 252 s. ISBN 80-225-1633-3.
2. Berry, L. L. *Relationship marketing of services – growing interests, emerging perspectives*. In: Journal of the Academy of Marketing Science, roč. 23, 1995, č. 4, s. 237 – 245.
3. Diačiková, A. (online). *Interný a externý marketing knihovníka a informačného špecialistu*. In INFORUM 2008: 14. konferencia o profesionálnych informačných zdrojoch, 2008. s. neuvedené. [cit. 27. 4. 2009]. Dostupné na: <http://www.inforum.cz>.
4. Morgan, R. D., Hunt, S. D. *The commitment-trust theory of relationship marketing*. In: Journal of Marketing, roč. 58, 1994, s. 20 – 38. ISSN 1547-7185.

5. Ďaďo J., Petrovičová, J., Kostková, M. *Marketing služieb*. Bratislava: Epos, 2006. 295 s. ISBN 80-8057-662-9.
6. Egan, J. *Relationship marketing. Exploring relational strategies in marketing*. Gosport: Ashford Colour Press, 2008. 311 s. ISBN 978-0-273-71319-7.
7. Gronroos, C. *Services management and marketing. Managing moments of truth in service competition*. Lexington : Lexington Books, 1990. 320 s. ISBN 978-0669-2003-55.
8. Gummesson, E. *Making relationship marketing operational*. In: International Journal of Service Industry Management, roč. 5, 1996, č. 5, s. 5-20. ISSN 0956-4233.
9. Gummesson, E. *Total relationship marketing*. Oxford: Butterworth – Heinemann, 2008. 376 s. ISBN 978-0-7506-8633-4.
10. Harwood, T., Garry, T., Broderick, A. *Relationship marketing – perspectives, dimensions and contexts*. Glasgow: Bell and Bain, 2008. 242 s. ISBN 978-0-07-71142-0.
11. Janečková, L., Vašítková, M. *Marketing měst a obcí*. Praha: Grada, 1999. 184 s. ISBN 80-7169-750-8.
12. Janečková, L., Vašítková, M. 2008. *Marketing služieb*. Praha: Grada, 2008. 232 s. ISBN 978-80-247-2721-9.
13. Klimentová, L. (online). *Personálny manažment verzus personálny marketing*. [cit. 27. 4. 2009] Dostupné na: <http://www.law.muni.cz>.
14. Michalová, V. *Manažment a marketing služieb*. Bratislava: Ekonóm, 2004. 218 s. ISBN 80-225-177-5-5.
15. Narver, J. C., Slater, S. F. *The effect of a Market Orientation on Business Profitability*. In: Journal of Marketing, roč. 54, 1990, č. 4, s. 20-35. ISSN 1547-7185.
16. Payne, A. *Marketing služieb*. Praha: Grada, 1996. 248 s. ISBN 80-7169-276-X.
17. Payne, A. *Handbook of CRM*. Oxford: Butterworth-Heinemann, 2006. 438 s. ISBN 978-0-7506-6437-0.
18. Proctor, T. *Public sector marketing*. Glasgow: Bell and Bain, 2007. 225 s. ISBN 978-0-273-70809-4.
19. Werther, W. B., Davis, K. *Lidský faktor a personální management*. Praha: Victoria Publishing, 1992. 635 s. ISBN 80-85605-04-X.

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CAN WE MEASURE GENDER INEQUALITIES?

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Abstract: The aim of this paper is to examine the effort to standardize measurement of gender inequality by way of creating an innovative new gender inequality index (GII). Most of the questions and explanations in this paper evaluate the ability of GII indicator to capture the true picture of gender inequality. In order to provide a comprehensive view of gender-related issues faced by each country the paper underlines the need of including other dimensions such as wage differences, occupational segregation, unpaid work, access to and control over material resources, etc.

Keywords: equal opportunities, gender inequalities, GII

1 Introduction

The importance of the principle of equal opportunities is quite normal in the minds of people and the idea of the implementation of equal rights for men and women in all levels of society and economy has been gradually adopted. The basic aim is to use such measures and policy instruments, which contribute to greater equality and equal chances in access to opportunities for both sexes. To do this, it is necessary find out a full picture of the gender inequality. A necessary assumption for fulfilling the concept of gender equality is to find such a right approach, which in the bright light reveals the true level of inequality.

The United Nations under its Development Programme (UNDP) has introduced an innovative new gender inequality index (GII) in 2010. This index is one of the three experimental indices¹ described in The Human Development Report². The main objective is to bring innovations in measuring inequality and poverty, based on belief that gender inequality is still strong barrier to human development. The GII is unique in including set of variables measuring disadvantages for women that have been neglected until now.

Although the initial attempts to create conventions focusing on gender equality date back to the forties the first global gender indices were created in the nineties. The Gender-related development index (GDI) and the Gender empowerment measure (GEM)³ were launched in 1995 with the belief that collecting and analyzing data show the gender disparities and demonstrate the importance of significant negative effects on sustainable development.

The aim of this paper is to use the new GII for further analysis to show how to construct a valid and reliable gender index. The need to use multi-dimensional aspects in the construction of the index is strongly emphasized as a necessity to eliminate the severe data limitations. The object of interest is also to identify the strengths and weaknesses of the examined index. This article uses GII as an indicator that shows a role of women in society. The main task of the paper is to define limitations of the current index and to explore potential addition of the concept.

2 Previous indices

As I mentioned, there have been two indices⁴ to measure gender equality since 1995. The first one, gender-related development index (GDI), shows inequality using three indicators: life

expectancy, educational attainment and adjusted real income. The methodology used imposes a penalty for inequality. It means that the greater the gender disparity the lower level of GDI. The calculation of the first indicator uses minimum and maximum values for female (27.5; 87.5 years) and male (22.5; 82.5 years) life expectancy at birth. An educational attainment is divided into two observed variables. The GDI gives two-thirds weight to adult literacy and one-third to combined primary, secondary and tertiary enrolment. The last step in calculation of GDI refers to estimated income which is the most complicated part, because of the lack of data on disparities between men and women in earned income and even on wages in some areas. At the end an adjustable parameter called ϵ is used, which represents penalty for inequality.

The relationship between the HDI and GDI is very close; they have the same base measurements focused on expansion of capabilities. Basically, GDI is the HDI adjusted. Using comparable data from the participating countries is built ranking according to gender inequality. It is hardly surprising that gender inequality exists in every country, but significant progress has been achieved since 1970.⁵

The second index, gender empowerment measure (GEM), is based on gender balance in decision-making. Promoting equal access for women to resources such as employment opportunities, political and economic participation indicates the existence of inequalities between male and female in a different dimension than reflects GDI. Measurement focuses on looking at the three basic indicators - female and male shares of parliamentary seats, female and male shares of positions as legislators, managers and of professional and technical positions, female and male estimated earned income.⁶ The difference between the perceptions of a common indicator - estimated earned income- is that while the GDI pursues an individual's ability to earn income, GEM captures what the level of economic independence of women is.

These two measures are certainly not the only indices that are used to detect gender inequality.⁷ But their wide range of countries and easy availability meant that they became a suitable source of data for the public debate on disproportion between men and women in many areas of human behaviour. This public debate helped to increase the general awareness that gender equality in its entirety can be a key to improving livelihoods and social, economic and political situation of many countries.

Both the GDI and the GEM as constructed does not provide a sufficient measure of women's status. Weaknesses of these indices appear in several key points. Gender inequality and its adverse effects on social progress cannot be truly captured by specifically incorporated variables. The criticism concerns the choice of variables that are separate indicators rather than to be able to show evidence of gender inequality as a whole. Therefore, we should be careful in the evaluation of the relationship between gender equality and economic development. The main weakness can be identified as the construction of indices themselves.

In the case of GEM, access to administrative and management positions has ambition to reflect decision making power of men and women in society. Female share in high labour market positions, in parliaments, management does not demonstrate the actual amount of power that is entrusted to women in their

⁵ Positive trend in GDI values and in other variables investigating women conditions (level of literacy, participation in the economy, representation in parliament, etc.) was examined in several studies; See: (Forsythe; Korzeniewicz; Majid; Weathers; Durrant, 2003); (Gray; Kittilson; Sandholtz, 2006); (Apodaca, 1998)

⁶ Human Development Reports, official internet page

⁷ For example: a, The Gender parity index (GPI) used by The United Nations Educational, Scientific and Cultural Organization (UNESCO) to measure females' and males' level of access to education at primary, secondary and tertiary school. (UNESCO, official internet pages); b, The Gender Equity Index 2009 (GEI) computed by Social Watch, classifies countries and ranks them according to indicators in three dimensions, education, economic participation and empowerment. (Social Watch, official internet pages)

¹ The Inequality-adjusted Human Development Index (IHDI), The Multidimensional Poverty Index (MPI) and The Gender Inequality Index (GII)

² Human Development Reports, official internet page

³ Human Development Reports, official internet page

⁴ Source of the whole paragraph: Human Development Reports, official internet pages

positions. High representation of women in national parliaments should not be blindly pursued goal. First, real political and economic power of women can hardly someone measure, but it might help to look at female share in lower level of public authorities, municipalities, unions and other organizations and companies in private sector. (Dijkstra, 2001) Second, proportion of women in national governments in certain countries may be very small just because it is the result of their tradition and customs. Then this is not a gross injustice that can be righted by granting women a specific quota of representatives in parliament. Increase female representation in parliament in less developed countries should be in accordance with their principles formed by traditions instead of violent and rapid changes.

The choice of indicators is at least questionable (Moser, 2007). Some of them, for example estimated earned income, does not tell us anything about intra-household resource distribution, which may reinforce income differences. Another overlooked fact is women's unpaid work which should be included somehow. Other limitations of measurements have been recognized as well (Stanton, 2007). Still, we should bear in mind, that the creation of such indices has had a positive impact. As an experimental work, both of them have caused a raising interest and attention among academics and policy makers on this issue.

3 New index

Due to the mentioned shortcomings in the measurement these two indices (GDI, GEM) occurred attempt to develop a new improved index. The alternative measure was named Gender inequality index (GII) and it represents a major step towards monitoring gender inequality and reflecting various dimensions of disadvantages for women.

3.1 How to calculate GII

The index shows the loss in human development results from inequality between men and women. The GII captures women's disadvantage in three dimensions - reproductive health, empowerment and the labour market. It ranges from 0, which indicates no inequality, to 1, which indicates absolute inequality in all measured dimensions. More the gender equality, more GII is close to 0.⁸ The index is innovative in efforts to be a universal measure of women's status. What is new is the use of multidimensional approach which is more meaningful to compare the status of women cross-nationally with respect to particular aspects in included countries. At the same time, we suggest that the choice of one indicator or another can make an important difference for the ranking of countries and hence the overall empirical results.

Reproductive health as a one of components of the GII measures maternal mortality ratio and adolescent fertility rates. First one can reliably detect health care that women receive during childbirth. Many women lose their lives due to inadequate antenatal care and prevention involves regular medical visit by pregnant women. The adolescent fertility rate measures number of births to women aged 15 - 19. High level of both indicators occurs especially in developing countries as implies recent work Reynolds; Wong and Tucker (2006). Poor access by couples to information about family planning and such services to prevent early motherhood cause that babies born to teenagers who are facing greater risk of complications during pregnancy. Adolescent mothers and their children usually live under conditions of poverty, family instability and life uncertainty. Moreover motherhood also limits women to obtain higher education. Limited opportunities for better education have a negative effect on women's employability in the future.

Like the previous index GEM, GII highlights women's representation in parliament. The proportion of seats held by women in national parliaments can be described as an indicator of agency. Low levels of female participation in the national parliaments of most countries results from inadequate women's

educational achievements and political parties and electoral systems, which enhance the ability of men to access to political leadership. A much stronger barrier of women's opportunities to participate in politics is existence of gender stereotypes and cultural norms in countries where men play a dominate role in the political arena for long time.⁹

Parliamentary representation of women is closely associated with their educational attainment and vice versa. Next GII component reflects differences between men and women in such areas as educational attainment. The increase in educational attainment resulted in increased opportunities for women in labour market, in improved the long-term socioeconomic well-being of women and in possibility to participate in public life. Educated women are expected to achieve greater satisfaction of applying a full spectrum of their rights and of their professional success and career.

Labour force participation as last described indicators of GII, measures female involvement in paid work.¹⁰ Focussing on recent trends, it is clear that labour force participation rates of women have globally remained steady in the two decades (1990 - 2010).¹¹ However, sub-regional trends in the case of women show great variation. It is generally accepted idea that increase in female labour force participation goes along with the improvement socio-economic status of women and enhancement their economic or financial independence.

3.2 What lies outside of GII interest?

In fact GII is not perfect, but so far the great attempt and challenge to capture true gender inequality. There exists still need to find a source of information that indicates differences in the distribution of achievements between women and men in the countries around the world in order to enhance awareness and public debate about inequalities. The relationship between gender equality and development has been supported in several studies¹², which show positive effects of greater female participation on the economy. Attention to the same opportunities for men and women comes from the conviction that the advancement of women has a significant impact on the growth of nations.

The gender inequality is multifaceted and therefore only a composite index can capture all aspects of it. That is why the multidimensional approach is right way to avoid shortcomings and misinterpretations cause by indices consisting of a few indicators. The GII has ambitions to provide a comprehensive view of gender-related issues faced by each country. The index is innovative in one essential point: it includes five indicators and three dimensions. It is useful to measure multidimensional concept which takes into account these aspects of gender inequality. More dimensions capture gender inequality in a much broader perspective and explain issue in its entirety.

Although the aim is to define important aspects of gender equality and inequality there are still significant conditions which lie outside general interest. Most neglected aspects are information related to labour force participation. First, GII does not look at wage differences. Differences in wages between men and women are of great importance because it affects a large number of people. In general, women's wages are lower than men's wages everywhere, but the gender pay gap is not uniform cross-nationally. (Polachek; Xiang, 2009) The gender wage gap varies considerably across countries not only in Europe. Although part of gender pay gap can be explained by the differences in education, age, skills, experience, but some persistent differences cannot be explained by objective reasons. Part of the wage gap remains unexplained and potentially related to discrimination¹³ and Glass Ceiling phenomenon¹⁴.

⁹ See Paxton and Kunovich (2003) for further details.

¹⁰ The labour force is economically active population who is either employed or unemployed (but actively seeking work and currently available for work) - labour force classification from ILO, official internet pages

¹¹ Mrkić (2010)

¹² See European Commission (2010a) and Mason and King (2001)

¹³ See Levine (2004: pp. 5-9) for further details about the unexplained portion of the gender pay gap

¹⁴ The Glass Ceiling describes an invisible barriers that affect women in their rising to the decision making positions in an organization and that result in less frequent promotion of women.

⁸ Human Development Reports, official internet page

Second, we should include a measure of the degree of occupational segregation by gender in the labour market. This is significantly important in light of the fact that the male occupations tend to be higher paying, with greater promotional opportunities and better conditions of employment. Anker's (1998) analysis affords us the opportunity to understand occupational segregation by sex in the world. In the first place job segregation refers to different characteristic such as personal quality, educational attainment and skills. Occupations for women are strongly consistent with gender roles and stereotypes at the same time. Traditional gender stereotypes are determined by cultural assumptions that women are well-suited to particular occupations.

Gender roles affect men and women in other ways. Specifically, gender stereotypes influence how men and women spend their free time and it has decisive influence on the division of household labour and childcare as well. Housekeeping and infant care presents an obstacle to the participation in the labour market and to the gain a material satisfaction for women. Housework, care of children and care of elderly relatives describe women's unpaid work which is indispensable financial support to the entire economy. Several explorations¹⁵ show that the value of these home-produced goods and services contributes to economic well-being.

Focus on the proportion of time devoted to unpaid work awakes interest in measurement and valuation of non-market work and probable connection to the distribution of family income among married couples. The women's share of family income is closely related to access to material resources. The ownership of economic assets by women and men is another important issue not included in GII. With greater ownership and control over economic assets women are less likely to experience poverty (in case of a divorce or the death of the partner) and are better able to withstand financial crises and care for their children. Women who own property or have access to ownership of land, housing and other assets are better positioned to improve their status and gain equal opportunities and become economically independent which provide them significant benefits. That is why we consider material possessions to be a crucial implication.

Following relevant issue to women's well-being, violence against women, presents manifestation of the denial of women's equality and dignity. Gender-based violence is still widespread and associated with low socio-economic status of women. Women face up to different types of domestic violence with miscellaneous consequences for them and for those who witness it, especially children. Data provided by World Health Organization (WHO) give evidence of a proportion of women who had experienced physical or sexual violence by intimate partners that ranges from 15% to 71%.¹⁶

The last mentioned dimension is a matter of law, particularly how the law can advance women's rights. One of the possible options on how to prevent discrimination against women is to implement the requirement of equal treatment in legislation. First of all, equality of rights between women and men must be enshrined as an essential principle. Legal shortcomings and barriers that hinder protection of human rights should be identified and eliminated mainly at national level. Although it is only an administrative weapon, it has big impact on human behaviour in society and allows create the awareness of Right and Wrong. Almost everyone can distinguish Right from Wrong but experiences have shown that it is necessary to confirm these rights in the constitution.

The latest developments of anti-discrimination legislation and policy in individual countries are very different. There still exists insufficient current legal protection against discrimination in the world. However, several countries have implemented the requirement of equal treatment of women and men into their national and regional legal systems recently. The principle of equal treatment between women and men, which is essential to respect such fundamental rights, has become hallmark of the European Union's gender equality policy¹⁷. EU emphasizes the importance of full implementation of greater promotion of

gender equality in new legislation and encourages Member States to strengthen their efforts to extend present legal framework.

The above analysis points to necessity of including other dimensions such as wage differences, occupational segregation, unpaid work, access to and control over material resources, violence against women, anti-discrimination laws, that govern the way people can expect to be treated with regards to their sex. Further we should add female share in lower level of public authorities, municipalities, unions and other organisations and companies in private sector in order to determine true picture of political and economic power of women. The aim was to define important aspects of gender equality and inequality that may be captured by multidimensional index. These possible extensions of GII get us closer to index which provides an adequate and relevant comparative measure of women's status.

It is pointed out that in real life we are confronted by many difficulties, from lack of empirical information to the subjective perception of inequality. Mentioned dimensions and aspects of gender inequality are difficult to discover due to data constraint. Most data are not available for large number of countries. The ability to identify women's status is limited by an absence of sex-disaggregated data and by the way in which the data are collected. Data limitations appear especially in developing countries where it has been assumed that data-collection processes are inadequate and trustworthy (Bradley; Khor, 1993). This means that unobserved factors lead to an incomplete or partial understanding of the inequality. To overcome these barriers it is necessary to strengthen national statistical systems and implement reliable statistical methods. Access to data is vital to gender-equality analysis and hence there exists urgent need for collection of required figures for measuring women's status.

4 Conclusion

It is essential to develop an overall index in order to capture significance of gender inequality. It should be emphasized that the construction of a composite index is not a straightforward process. It works with assumptions that have to be evaluated prudently in order to capture all possible effects among factors and to find out the relationship between the parameters inside the model.

In this paper, a new way to measure gender inequality was introduced. The effort to create a relevant tool to capture gender inequalities has become a significant challenge for everyone involved. It is generally recognized that concept of gender equality is a pervasive phenomenon and important issue in itself that results in finding such a right approach, which in the bright light reveals the true level of inequality. The main reason for measuring the size of the mentioned problem is a prerequisite for identifying the best solutions.

The paper showed how essential was initial attempts to create benchmarks and indicators to compare the achievements in women's equality around the world. At the beginning of the paper, two previous indices are presented. Both of them do not provide a sufficient measure of women's status, as is clear from the evaluation. That is why the alternative measure, named GII, was constructed. This attempt represents a major step towards monitoring gender inequality and reflecting various dimensions of disadvantages for women. The GII has ambitions to provide a comprehensive view of gender-related issues faced by each country, but this paper highlights its shortcomings and limitations.

The analysis points to necessity of including other dimensions such as wage differences, occupational segregation, unpaid work, access to and control over material resources, violence against women, anti-discrimination laws, that govern the way people can expect to be treated with regards to their sex. The extension of the GII provides a more compact picture of gender inequality.

Literature:

1. Anker, R.: *Gender and jobs: Sex segregation of occupations in the world*. Geneva: International Labour Office (ILO), 1998. 444 p. ISBN: 92-210-9524-X

¹⁵ See (Antonopoulos; Hirway, 2010); (Baker, 2007) and (Coleman, 1998)

¹⁶ (Jansen; Watts; Ellsberg; Heise; Garcia-Moreno, 2005)

¹⁷ See European Commission (2010b)

2. Antonopoulos, R.; Hirway, I.: *Unpaid Work and the Economy: Gender, Time-Use and Poverty in Developing Countries*. Hampshire: Palgrave Macmillan, 2010. 336 p. ISBN 978-0-230-21730-0
3. Apodaca, C.: *Measuring Women's Economic and Social Rights Achievement*. In *Human Rights Quarterly*, Vol. 20, No. 1 (Feb., 1998), pp. 139-172. Published by: The Johns Hopkins University Press
4. Baker, K. K.: *The problem with unpaid work*. In *University of St. Thomas Law Journal*, Vol 4, No. 3. No. pp. 599-623. Florida: Harvard Press, 2007. <http://www.stthomas.edu/law/programs/journal/Volume4num3/The_problem_with_unp.pdf>
5. Bradley, K.; Khor, D.: *Toward an Integration of Theory and Research on the Status of Women*. In *Gender and Society*, Vol. 7, No. 3 (Sep., 1993), pp. 347-378. Published by: Sage Publications, Inc.
6. Coleman, R.: *Economic Value of Unpaid Housework and Child Care in Nova Scotia*. Halifax: GPI Atlantic, 1998. 123 p. <<http://www.gpiatlantic.org/pdf/housework/housework.pdf>>
7. Dijkstra, A. G.: *Revisiting UNDP'S GDI and GEM: Towards an alternative*. In *Social Indicators Research*, Vol 57, pp. 301-338. Netherlands: Kluwer Academic Publishers, 2002. <<http://publishing.eur.nl/ir/repub/asset/1580/BSK059.pdf>>
8. European Commission (2010a): *More women in senior positions: Key to economic stability and growth*. Luxembourg: Publications Office of the European Union, 2010. 65 p. ISBN 978-92-79-14415-8
9. European Commission (2010b). *Strategy for equality between women and men 2010-2015*. Brussels: European Commission, 2010. 12 p. ISBN COM(2010) 491 final. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0491:FIN:EN:PDF>
10. Forsythe, N.; Korzeniewicz, R. P.; Majid, N.; Weathers, G.; Durrant, V.: *Gender inequalities, economic growth and economic reform: A preliminary longitudinal evaluation*. Geneva: International Labour office Geneva, 2003. 28 p. <http://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_115121.pdf>
11. Gray, M. M.; Kittilson, M. C.; Sandholtz, W.: *Women and Globalization: A Study of 180 Countries, 1975-2000*. In *International Organization*, Vol. 60, No. 2 (Spring, 2006). pp. 293-333. Published by: Cambridge University Press on behalf of the International Organization Foundation
12. Human Development Reports, official internet page: <<http://hdr.undp.org/en/reports/>>
13. Jansen, H. A. F. M.; Watts, Ch.; Ellsberg, M.; Heise, L.; García-Moreno, C.: *WHO Multi-country study on women's health and domestic violence against women: Initial results on prevalence, health outcomes and women's responses*. Geneva: World Health Organization, 2005. 206 p. ISBN 92 4 159351 2
14. Levine, L.: *The gender wage gap and pay equity: Is comparable worth the next step? (CRS Report 98-278 E)*. Washington, DC: U.S. Government Printing Office, 2004. 26 p. <http://digitalcommons.ilr.cornell.edu/key_workplace/195>
15. Mason, A. D.; King, E. M.: *Engendering development through gender equality in rights, resources, and voice*. Washington, D.C.: World Bank; New York: Oxford University Press, 2001. 364 p. ISBN 0-19-521596-6
16. Moser, A.: *Gender and indicators: Overview Report*. Brighton: Institute of Development Studies, July 2007. 55 p. ISBN 978-1-85864-636-7. <<http://www.bridge.ids.ac.uk/reports/IndicatorsORfinal.pdf>>
17. Mrkić, S. (ed.): *The World's Women 2010: Trends and Statistics*. New York: United Nations, 2010. 255 p. ISBN 978-92-1-161539-5
18. Paxton, P.; Kunovich, S.: *Women's political representation: The importance of ideology*. In *Social Forces*, Vol. 82, No. 1 (Sep., 2003), pp. 87-113. Published by: University of North Carolina Press
19. Polachek, S. W.; Xiang, J. (Jeff): *The gender pay gap across countries: A human capital approach*. Berlin: German Socio-Economic Panel Study, 2009. 59 p. <http://www.diw.de/documents/publikationen/73/diw_01.c.342785.de/diw_sp0227.pdf> ISSN: 1864-6689
20. Reynolds, H. W.; Wong, E. L., Tucker, H.: *Adolescents' use of maternal and child health services in developing countries*. In *International Family Planning Perspectives*. Vol. 32, No. 1, (Mar., 2006), pp. 6-16. Published by: Guttmacher Institute
21. Social Watch, official internet pages <<http://www.socwatch.org>>
22. Stanton, E. A.: *Engendering human development: A critique of the UNDP's Gender-Related Development Index*. University of Massachusetts Amherst: Political economy research institute, March 2007. <http://www.peri.umass.edu/fileadmin/pdf/working_papers/working_papers_101-150/WP131.pdf>
23. UNESCO, official internet pages: <<http://www.unesco.org>>
24. United Nations, official internet page: <<http://www.un.org/en/>>

Primary Paper Section: A**Secondary Paper Section: AO**

PRICE STABILITY AND ITS REALIZATION - THE CASE OF THE CZECH REPUBLIC AND POLAND

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Abstract: This article presents actions taken by the National Bank of Poland and the Czech National Bank to ensure price stability. Price stability is recognized as a primary goal of monetary policy, because it leads to sustainable economic growth in the long term. The importance of maintaining price stability has increased in the context of the global crisis, which caused that the inflation rate was periodically beyond the predetermined target. Realization of price stability is not only affected by macroeconomic conditions, but also by other variables like the nature of inflation expectations and the level of the central bank's credibility.

Keywords: inflation, inflation targeting, price stability.

1 Introduction

By the end of 1970s a consensus in economic theory was achieved, which came down among others to considering price stability as a primary goal of monetary policy. Price stability allows effective realization of the main goal of economic policy, which is to ensure sustainable economic growth in the long term. Therefore, many central banks around the world recognize price stability as the primary goal of their policy. That mandate has also been given to the National Bank of Poland (NBP) and the Czech National Bank (CNB). Both central banks undertake to conduct monetary policy aimed at stable and low inflation growth.

2 Price stability and its economic significance

Price stability can be simply defined as a stable general price level or a situation of avoiding both prolonged inflation and deflation¹. Price stability is often identified with a durable and low inflation rate, but this approach is not quite correct. O. Issing talking about price stability distinguished between: steady-state deflation, a constant price level or zero inflation, and low inflation². These approaches indicate a different direction of changes in price level, which is included in the concept of price stability. It means that prices are stable even when the average price level decreases, is constant or is slightly increasing³.

Among many advantages of price stability, the European Central Bank emphasizes the growth in economic activity and employment growth, which arise from the increased transparency of the price mechanism, reduction of risk premium due to stable inflation, as well as ensuring the financial stability⁴. But above all, the effect of stable inflation on the growth is made by shaping inflation expectations. Thus, stable and low inflation expectations stimulate the decision-making processes influencing the economic growth. That point of view was expressed by A. Greenspan, when he said: "We will be at price stability when households and businesses need not factor expectations of changes in the average level of prices into their decisions"⁵.

Central banks, aiming for goal defined as maintain price stability, usually use a precise definition of the inflation target. Central banks, introducing to monetary policy that inflation target, usually decide to use a regime, which is the inflation

targeting strategy. According to F.S. Mishkin⁶, the essence of this strategy includes a public announcement of the medium-term numerical inflation target and institutional commitment of monetary authorities to consider price stability as the primary objective of monetary policy. Furthermore, the implementation of inflation targeting is based on the use of any available information that comes from many macroeconomic indicators⁷. That information is used to streamline the decision-making process, especially concerning the selection of instruments of monetary policy, which may be commensurate with the actual economic situation. Given the fact that this strategy is based on many factors which affect the economy, it is often described as the *strategy of looking at everything*⁸. However, due to the fact that different central banks set their own levels of inflation targets, it is difficult to point to a universal quantitative definition of price stability. Furthermore, differences are also connected with the measure of inflation, which usually is the core inflation index or CPI index. The practice of modern central banks shows that they usually specify their purpose to keep inflation within 2% CPI index.

3 The realization of central bank's inflation target in the Czech Republic and Poland

In the Czech Republic the inflation targeting (IT) was formally launched in early 1998 in accordance with the decision of the the CNB Bank Board, taken in December 1997. In preparation for the new strategy, the CNB in December 1997 announced both the inflation target for the next year and the medium-term objective to be achieved at the end of 2000. In the first period of the strategy, the verification of the target was followed on the basis of the net inflation growth rate, realized at the end of December. During the course of the successful period of disinflation, in 2001 the CNB announced the transition to a new stage in monetary policy, aimed at ensuring a stable price level. The new assumptions were defined in the document *The Setting of the Inflation Target for 2002-2005*. According to this the inflation target was defined as the decreasing range of CPI from 3% -5% in January 2002 to 2% -4% in December 2005. The strict realization of price stability was started at the beginning of 2006. According to *The CNB's Inflation Target from January 2006*, the inflation target was set as 3% growth of year-on-year CPI with permitted fluctuations of ± 1 percentage point. In this document the CNB stressed the importance of anchoring inflation expectations. It also claimed that this objective will be continued until accession to the euro area. But in March 2007⁹, the CNB announced a new target from January 2010, which was determined as 2% growth of year-on-year CPI with permitted fluctuations of ± 1 percentage point.

In Poland, the decision about implementing the IT was taken by the Monetary Policy Council (MPC) in 1998 and assumptions of this strategy were formulated in *Medium-Term Strategy of Monetary Policy (1999-2003)*. This strategic document stated that the medium-term goal of the NBP would be to reduce the consumer price growth rate below 4% by the end of 2003. During 1999-2003 verification of the goal was made by comparing the CPI index with the target announced in monetary policy guidelines for each year. In 2004 the NBP started to implement a new target in monetary policy aimed at stabilizing the price level. The new inflation target was defined in the *Monetary Policy Strategy beyond 2003*. After 2003, the target set by MPC was to attain a stable inflation growth of 2.5% CPI with permissible volatility bandwidth of ± 1 percentage

¹ According to the European Central Bank, <http://www.ecb.europa.eu>.

² O. Issing, *Why Price stability?*, an article from *Why price stability?*, First ECB Central Banking Conference, 2 and 3 November 2000, Frankfurt am Main, Germany, p. 187-192, <http://www.ecb.int> [access 26.11.2011].

³ See: *ibidem*.

⁴ According to the European Central Bank, <http://www.ecb.europa.eu>.

⁵ A. Greenspan, *Testimony before the Subcommittee on Economic Growth and Credit Formation of the Committee on Banking, Finance and Urban Affairs*, U.S. House of Representatives, February 22, 1994, p. 5., http://fraser.stlouisfed.org/historicaldocs/805/download/27973/Greenspan_19940222.pdf, [access: 26.11.2011].

⁶ F.S. Mishkin, *Inflation Targeting in Emerging Market Countries*, NBER Working Paper no. 7618, Cambridge 2000, p. 1-2.

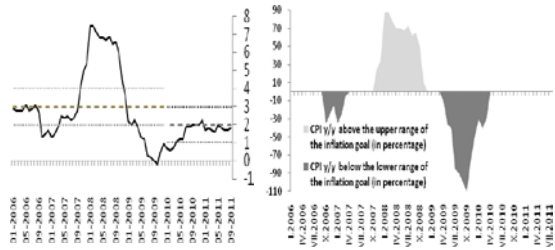
⁷ *ibidem*.

⁸ J. Drop, A. Wojtyna, *Strategia bezpośredniego celu inflacyjnego: przesłanki teoretyczne i doświadczenia wybranych krajów*, Materiały i Studia, zeszyt nr 118, Narodowy Bank Polski, Warszawa 2001, p. 4.

⁹ *The CNB's new inflation target and changes in monetary policy communication*; www.cnb.cz [access 26.11.2011].

point. Due to continuous targeting, it is possible to evaluate the new target at any time during the year, not only at the end of a given calendar year (like under the *Medium-Term Strategy of Monetary Policy (1999-2003)*).

Figure 1. CPI y/y (year-on-year) compared to the inflation target in the years 2006-2011 (left side) and percentage deviation of the inflation index CPI y/y outside the target range (right side) in the Czech Republic

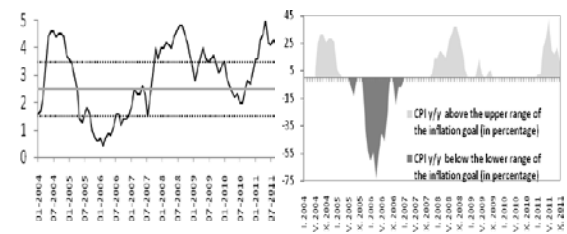


Source: own calculations based on the Czech National Bank data (www.cnb.cz)

The left side of the figure above shows the CPI in the Czech Republic and the CNB's inflation target. As already mentioned, in 2006-2009 the target of the CNB was 3% CPI with range of ± 1 percentage point while in January 2010 it was lowered to 2% CPI with ± 1 percentage point. During the analyzed period, the CNB showed in monetary policy fairly strong determination in achieving the inflation target. Significant deviation from the target was during the financial crisis (2007-2009). Moreover, in late of 2009, in the Czech Republic was appeared the threat of deflation, significantly associated with the crisis in the real economy. In October 2009, the percentage deviation of CPI from the lower limit of the inflation target (announced as 2% CPI) was roughly 110% (in October in the Czech Republic was deflation: -0.2% CPI). During 69 analyzed month in 13 cases (about 19% of observations) inflation went beyond the upper permissible variations. These high rates of CPI were connected with the initial part of the global financial crisis.

In Poland, during the analyzed period from January 2004 to October 2011, the NBP had quite big problems with keeping inflation close to the central level of the target (2.5% growth of consumer price index) and also was not able to maintain the long-term fluctuations of inflation in the permitted bandwidth. It should be noted that during the first stage of the financial crisis (2007-2009), the deviation of inflation outside of the permissible fluctuations was much lower in Poland than in the Czech Republic (compare figure 1 with 2). During mentioned period, inflation in Poland slightly exceeded the upper limit of the target. Despite the lower level of inflation deviations outside the permitted bandwidth, the NBP was not able, like the NBC, to guarantee the return of inflation to the announced target path. While inflation in the Czech Republic, as a result of complex of conditions, returned to the borders of the central values of the inflation target, then in Poland, during the same period, we could observe a significant acceleration of inflation. In a result, in May 2011, inflation reached 5% of the CPI. Last time, similar situation was at the end of 2001. In Poland, during 93 monthly observations of the CPI in 36 cases (approximately 39%) the CPI was exceeded the upper limit of the tolerance range, while in 14 months – the lower limit of the target. Altogether, in Poland in roughly 54% of monthly observations, inflation was outside the permitted bandwidth but in the Czech Republic similar situation occurred in 45% of observations.

Figure 2. CPI y/y compared to the inflation target in the years 2004-2011 (left side) and percentage deviation of the inflation index CPI y/y outside the target range (right side) in Poland



Source: own calculations based on data of the National Bank of Poland data (www.nbp.pl) and the Central Statistical Office (www.stat.gov.pl)

4 Macroeconomic performance of monetary policy in Poland and the Czech Republic

The IT takes into account all kinds of information that can be considered in decisions about monetary policy instruments. This section of the article presents the conditions that accompanied the implementation of IT in Poland and the Czech Republic and also determined the effectiveness of monetary policy and influenced on the decisions taken by both central banks.

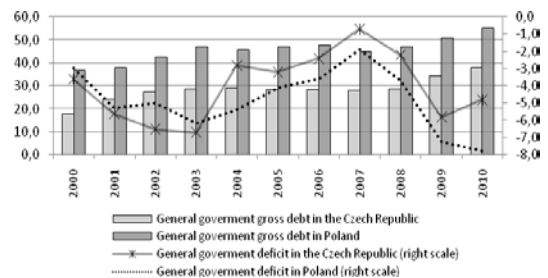
Figure 3. Quarterly year-on-year growth rate of the GDP in Poland and the Czech Republic



Source: based on the Eurostat data (www.eurostat.ec.europa.eu)

The condition of the economy may be evaluated by analyzing the growth rate of GDP. During the period 1998-2011 the quarterly GDP growth rate developed more stable in the Czech Republic than in Poland. From the fourth quarter of 2002 in the Czech Republic we can observe a period of relatively stable economic growth, lasting until the second quarter of 2007. This period was accompanied by low and stable inflation growth. Following the global financial crisis, both Poland and the Czech Republic, experienced a fall in the rate of economic growth. The resistance to the crisis was bigger in Poland than in the Czech Republic. Polish economy managed to maintain a positive economic growth throughout all the analyzed period. Although in the second quarter of 2009 the Czech economy contracted by 4.8% in comparison to the second quarter of 2008, but in Poland the growth rate was still positive. The economic crisis in the Czech Republic was accompanied by short-term deflation observed over the third and fourth quarter of 2009 (see figure 3).

Figure 4. Public debt and budget deficit as a % of GDP in Poland and the Czech Republic

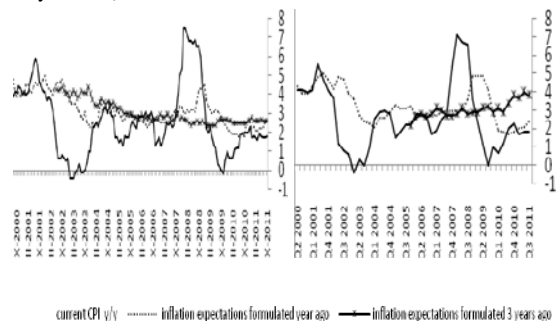


Source: based on the Eurostat data (www.eurostat.ec.europa.eu)

The condition of the public finances has also a big impact on monetary stability. Figure 4 presents the public debt and the budget deficit as GDP % in both analyzed countries. In Poland and the Czech Republic, prior to EU accession, the essential problem was to reduce the budget deficit to the size adopted in the Maastricht Treaty. In terms of the fiscal criteria, the Czech economy is more well-balanced than Polish economy. However, a significant deterioration in the public finances indicators is observed in both countries in the context of the financial crisis. During that period the larger instability still applied to Polish than Czech economy. The instability of the public finances is a significant problem in Poland. In 2010 the government anti-crisis measures significantly increased the size of the public debt (to 54.9% of GDP) and the budget deficit (to 7.8% of GDP). In the same time in the Czech Republic, despite the economic slowdown, the public debt was roughly 37.6% of GDP and the deficit roughly 4.8% of GDP. The relative improvement of the public finances in the Czech Republic during the years 2009-2010 (mainly the reduction of budget deficit) helped to reduce the inflationary pressure and contributed to return of inflation to a designated path. In the case of Polish public finances, including a growing deficit, the NBP had some problems with stopping inflationary processes. Moreover, at the beginning of 2011, the inflation growth in Poland was associated with increasing burden of the VAT and increasing inflation expectations of households.

As mentioned, inflation also depends on the inflation expectations of households and business. In IT strategy very important are also inflation forecasts, formulated in advance for the coming years. Their aim is to anchor inflation expectations and help to reduce inflationary pressures in future years. Anchoring inflation expectations is oriented towards stabilization of inflation at a low level in the long run. Thus, the monetary policy is more transparent, the more likely to maintain price stability. The significant role in shaping inflation expectations, and thereby maintaining price stability, is played by central bank's credibility. "A central bank is credible if people believe it will do what it says."¹⁰ The reputation of the central bank is important in shaping price stability and it is also an essential part of its institutional framework. In order to increase the credibility of monetary policy, the central banks strive for maintaining the increased communication with market participants, increasing the degree of policy transparency and taking responsibility for its implementation. Most of the central bank's reputation is built by a public announcement of the realization of their inflation target and explaining the reasons and circumstances that influenced the degree of its fulfillment. One of the tools of building reputation are reports publications. Both the CNB and the NBP regularly publish documents like: reports on inflation, reports of MPC meetings or annual reports.

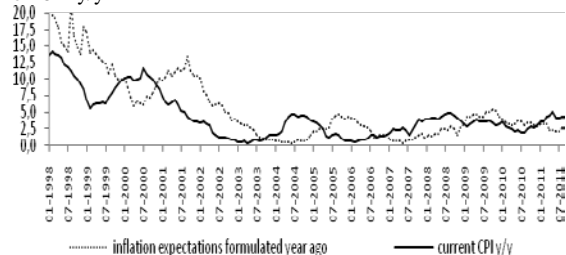
Figure 5. Inflation expectations of financial markets (left side) and non-financial sector (right side) in the Czech Republic (year-on-year CPI)



Source: based on the data of the Czech National Bank (www.cnb.cz)

According to the above figure 5, the period of macroeconomic stability was connected with the low inflation expectations, formulated by both non-financial sector and financial sector. Expectations of financial markets were more stable and anchored at the level of the announced inflation target. Moreover, the long-term inflation expectations (formulated three years ahead) were close to the target. It should be noted that in the case of financial markets, high inflation fluctuations from the years 2007-2009 had a small influence on inflation expectations, formulated by participants of this markets. In the case of non-financial sector (right side of figure 5) the relationship between inflation and inflation expectations is a bit clearer, but also the expectations seem to be firmly anchored in the bandwidth of inflation target.

Figure 6. Inflation expectations of private sector in Poland based on CPI y/y



Source: based on the data of National Bank of Poland (www.nbp.pl)

In Poland, the period of disinflation, conducted in the framework of the *Medium-Term Strategy of Monetary Policy (1999-2003)*, was accompanied by a significant reduction in inflation expectations of the households. A new stage in Polish monetary policy, aimed at ensuring price stability, was carried out at a lower, but quite a significant impact of the private inflation expectations. Although, the continuous inflation target helped to reduce the size of formulated expectations, but it wasn't able to exclude their fluctuations. Analysis of inflation expectations in Poland shows that they clearly have an adaptive character. Despite the regular publications of the inflation reports, the guidelines of monetary policy for the next years and the public announcements of inflation projections and projections of GDP, households still formulate their expectations based on the realized inflation rates. Thus, in Poland the problem of anchoring inflation expectations at the target level (2.5% CPI) is an important issue, especially because of the potential effectiveness of the IT strategy, as well as due to the determination of the NBP to maintain price stability.

The level of the credibility of the central bank stimulates the range of the public inflation expectations. Shown in figure 5 and figure 6 formations of inflation expectations have confirmation in many studies, which show that both the level of credibility and the level of reputation of the CNB is greater than the NBP¹¹. What is more, the importance of the central bank credibility affects not only the current monetary policy, but its importance is increasing in the face of the economic turmoil. As noted by M. Singer, in the current financial crisis, "numerous central banks have negative equity yet have no problems operating if they are credible enough. The real capital of a central bank is its credibility and reputation, not a figure on its balance-sheet"¹². The credibility of monetary authorities can determine the stability of entire the financial system and economy. The more credible the central bank is, the higher range of anchoring inflation expectations at the target level, and the greater is the efficiency of monetary policy, as well as the greater transparency

¹¹ For example: P. Arestis, K. Mouratidis, *Credibility of Monetary Policy in Four Accession Countries: A Markov Regime-Switching Approach*, Levy Economics Institute Working Paper No. 371, February 2003.

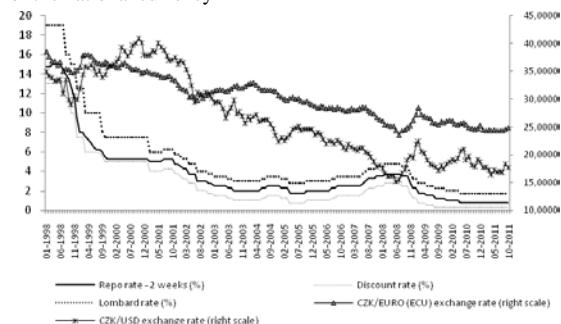
¹² M. Singer, *The Czech Republic outside EMU – a success story born from painful lessons. A Czech view on resolving the euro crisis*, Speech at Official Monetary and Financial Institutions Forum, Reform Club, London, 28 June 2011, p. 3; <http://www.bis.org/review/r110630a.pdf?frames=0>

¹⁰ A. S. Blinder, *Central-Bank Credibility: Why Do We Care? How Do We Build It?*, *American Economic Review*; December 2000, Vol. 90 Issue 5, p. 1422.

in decision-making process, and thus the higher degree of the economic stability in the long term.

The basic tools in implementing IT are interest rates. In the case of monetary policy implemented under IT, the one goal (inflation target) is connected with the one instrument responsible for its realization (interest rate). The direction of interest rates, especially the change of the main central bank's interest rates, shows the character of monetary policy – for example: periods of increasing inflationary pressure generally are connected with more restrictive policy of interest rate.

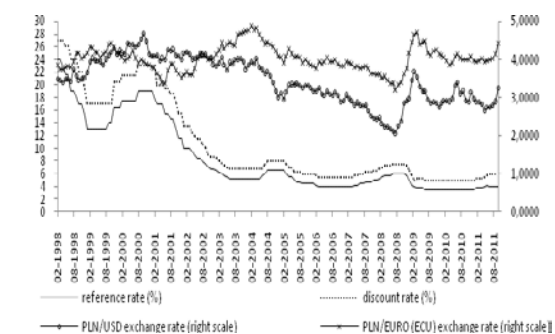
Figure 8. The CNB selected interest rates and the exchange rate of the national currency



Source: based on the data of the Czech National Bank (www.cnb.cz) and the Eurostat database (www.eurostat.ec.europa.eu)

Both the CNB and the NBP similarly responded to inflationary processes arising from the financial crisis. They mainly affected by raising interest rates. However, in 2009 the financial crisis shifted to the real economy, forcing central banks to stimulate the appropriate economic growth, initially by adjustments in interest rates. But during the financial crisis there appeared quite problematic issue. It referred to the phenomenon of relatively low inflation under conditions of simultaneous low interest rates. This problem was greater in the Czech Republic than in Poland. Therefore, stimulating economic growth by interest rates was limited, e.g. from August 2009 to October 2011, the CNB's discount rate was 0.25% while the main money market rate (2W REPO) during May 2010 to October 2011 amounted to 0.75% (see figure 8). In Poland in the same period, the character of monetary policy, due to increasing inflationary pressure, was more restrictive. The significant exceeding the inflation beyond permitted bandwidth was an impulse to make a decision to increase interest rates and next maintain them at the invariable level (see figure 9).

Figure 9. The NBP selected interest rates and the exchange rate of the national currency



Source: based on the National Bank of Poland data (www.nbp.pl) and the Eurostat (www.eurostat.ec.europa.eu)

The direction of changes of the exchange rate exerts influence on the achievement of price stability. In Poland, a fully floating

exchange rate, as a condition for the effective implementation of the IT, was introduced in April 2000, while in the Czech Republic in May 1997. During the financial crisis the exchange rate was one of the tools of influencing the effects of the economic growth. Due to the fact that the Czech economy is increasingly dependent on exports than is the Polish economy¹³, the strong appreciation of the Czech crown in relation to the USD and EURO in August 2008 adversely affected the trade and restricted the dynamics of the GDP growth. Also in Poland in 2008 was quite big appreciation of PLN in relation to the USD and EURO. The strong appreciation of the domestic currency was accompanied by the periods of monetary policy tightening, which was increasing the restrictive character of the activity of both central banks (see figure 8 and figure 9). The appreciation of national currency was also reflected in the real effective exchange rate (REER). Both the Czech Republic and Poland had the strongest appreciation of the REER in July 2008 (the REER of Czech Republic was 133.59 while the REER of Poland was 124.82)¹⁴. Following a significant appreciation in August 2008 the difference between the REER in both countries has significantly increased. From middle of 2008 the REER of Polish zloty was weakened in comparison to the REER for the Czech crown. The stronger appreciation of the Czech crown affected the size of exports, fairly declining in the GDP growth in 2009.

5 Conclusions

This article presents the attempt to evaluate the activities of the NBP and the CNB to conduct and maintain price stability. The article also presents selected conditions of monetary policy, that influence the efficiency of price stability realization.

In the late 1990s, both central banks introduced the IT. This strategy allowed for effective disinflation and after a period of lowering the inflation rate, central banks oriented monetary policy towards inflation stabilization at a low level. This strategy made it possible to implement the next stage of monetary policy - to ensure price stability. The analysis indicates that a relatively higher level of maintaining price stability was in the Czech Republic than in Poland. This effect was a result of a number of conditions, especially those that were beyond the control of national central banks.

The CNB policy was stimulated by relatively stable economic growth and well-balanced fiscal policy. Including the proper response to changes in the macroeconomic indicators, as well as strong determination to join the European Union and the euro zone, allowed the NBC to achieve a high degree of reliability and stability of inflation expectations at a level close to the announced inflation target. The high degree of the CNB confidence, which is formulated by financial markets and the private sector, meant that even in times of financial crisis current expectations insignificantly reacted to actual inflation. As a result of a number of conditions that initially threw inflation beyond the upper limit of the target range, the NBC in a fairly short time managed to reduce inflation to the level of the inflation target. It should be noted that it was done after a short term of deflation and in terms of relatively low levels of interest rates.

In Poland, inflation expectations of the private sector have a definitely adaptive character, connected with the realized inflation rate. The relatively lower, in comparison to the CNB, level of credibility of the NBP is quite a significant problem in the stabilization of inflation expectations, especially when the expectations influence the effectiveness of policy of price stability. On the other hand, efforts to maintain price stability in Poland are restricted, among other things, by the imbalance of

¹³ In the Czech Republic quarterly share of export in the GDP during 2004-2008 was around 76%, while in Poland this share was about 39%. As a result of the currency appreciation, in 2009 the relation of export to the GDP in the Czech Republic fell to about 69% (based on own calculations from the Eurostat database www.eurostat.ec.europa.eu)

¹⁴ Based on the Bank of International Settlements; www.bis.org, the REER growth rate index, year 2005=100

public finances. The efforts to ensure a monetary balance should be accompanied by sustainable public finances, in order to affect the processes of economic growth in the long term. In Poland the degree of public finance discipline is rather weak. As the analysis, in terms of the global crisis and unstable public finances, the Polish economy is more threatened by macroeconomic instability. Under these circumstances, maintaining price stability at the level of the central point of the inflation target may be difficult to reach, especially when the mandate of credibility for the NBP is quite limited. Moreover, in Poland, the risk of exceeding the fiscal criteria of convergence increases and, in result, the fiscal policy will not be able to ensure anti-crisis measures. Although the relatively lower real effective exchange rate of the Polish zloty than the Czech crown will be able to respond to economic development, it can also become one of the factors determining the size of public debt, resulting in the need to strengthen financial discipline. Due to that reason, fiscal policy without any reforms can slow down economic development.

An increasingly perspective of the second phase of the crisis in Europe causes a considerable degree of uncertainty about the ability of both NBC and the NBP to reach their targets. Now monetary policy is entering an area of uncertainty, associated with the operation under the conditions of financial turmoil, and in terms of relatively low inflation and low interest rates. Under these new conditions the effectiveness of the central bank's policy may depend strongly on its credibility. Given the relative adaptive nature of Polish inflation expectations and a relatively low level of confidence of the monetary institutions, the current distance of the NBP, compared to NBC, in relation to achieving price stability can be maintained and even the distance can widen.

Literature:

1. ARESTIS P., MOURATIDIS K.: *Credibility of Monetary Policy in Four Accession Countries: A Markov Regime-Switching Approach*, Levy Economics Institute Working Paper No. 371, February 2003.
2. BLINDER A.S.: *Central-Bank Credibility: Why Do We Care? How Do We Build It?*, American Economic Review, Dec2000, Vol. 90 Issue 5.
3. DROP J., WOJTYNA A.: *Strategia Bezpośredniego Celu Inflacyjnego: Przesłanki Teoretyczne i Doświadczenia Wybranych Krajów*, Materiały i Studia, Zeszyt nr 118, Narodowy Bank Polski, Warszawa 2001.
4. GREENSPAN A.: *Testimony before the Subcommittee on Economic Growth and Credit Formation of the Committee on Banking, Finance and Urban Affairs*, U.S. House of Representatives, February 22, 1994, http://fraser.stlouisfed.org/historicaldocs/805/download/27973/Greenspan_19940222.pdf [access: 26.11.2011].
5. ISSING O.: *Why Price Stability?*, an article from *Why Price Stability?*, First ECB Central Banking Conference, 2-3 November 2000, www.ecb.int [access 26.11.2011].
6. *Medium Term Strategy of Monetary Policy (1999-2003)*, Monetary Policy Council, Warsaw 1998.
7. MISHKIN F.S.: *Inflation Targeting in Emerging Market Countries*, NBER Working Paper no. 7618, Cambridge 2000.
8. *Monetary Policy Strategy beyond 2003*, Monetary Policy Council, Warsaw 2003.
9. The Bank of International Settlements (www.bis.org).
10. The European Central Bank (www.ecb.europa.eu).
11. The Eurostat (www.eurostat.ec.europa.eu).
12. The Central Statistical Office (www.stat.gov.pl).
13. The Czech National Bank (www.cnb.cz).
14. The National Bank of Poland (www.nbp.pl).
15. SINGER M.: *The Czech Republic Outside EMU – a Success Story Born from Painful Lessons. A Czech View on Resolving the Euro Crisis*, Speech at Official Monetary and Financial Institutions Forum, Reform Club, London, 28 June 2011; <http://www.bis.org> [access 26.11.2011].
16. *The CNB's Inflation Target from January 2006*; www.cnb.cz [access 26.11.2011].

17. *The CNB's New Inflation Target and Changes In Monetary Policy Communication*; www.cnb.cz [access 26.11.2011].

18. *The Setting of the Inflation Target for 2002-2005*. <http://www.cnb.cz> [access 26.11.2011].

Primary Paper Section: A

Secondary Paper Section: AH

PROJECT MANAGEMENT IN MICRO AND SMALL ENTERPRISES ON THE EXAMPLE OF PROJECTS UNDERTAKEN BY THE UNIVERSITY OF SZCZECIN

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Abstract: The paper presents the University of Szczecin's experiences with micro and small enterprises concerning the implementation of innovative process solutions and pre-implementation research. This form of cooperation took place in 2009-2011 and was part-financed by the Polish Agency for Enterprise Development. The paper describes the phases of the University of Szczecin's experience of cooperation with entrepreneurs, from a beauty contest to negotiations on the contract, delivery of the service and the final settlement. For selected case studies the continuation of the cooperation between enterprises and the scientific institution has been presented as achievement of one of the programme objectives, i.e. the establishment of cooperation between entrepreneurs and scientific institutions.

Keywords: innovation, implementation, project management

1 Innovation performance and efficiency of Polish micro, small and medium-sized enterprises

The survey carried out in June 2009 by the "Lewiatan" Polish Confederation of Private Employers among the enterprises considered in the "Innovation Tuning Fork 2008" ("Kamerton Innowacyjności 2008") ranking depicted to what extent the investments in innovation had affected the efficiency and competitive performance of those enterprises¹. The majority of the enterprises in question indicated that their investments in innovation made in 2007-2008 had a positive effect – better competitiveness being the most frequent one. The study shows that following the implementation of innovation, 89% of enterprises improved their competitiveness in terms of quality of their products in the Polish market, whereas 57% reported a similar improvement in foreign markets. Competitiveness in Polish and foreign markets was also analysed from other perspectives: innovation (reporting an increase by 82% and 51%, respectively), the quality of customer service (71% and 39%, respectively), prices (66% and 43%) and promotion and distribution (57% and 37%). Investment in innovation affected also the efficiency of the analysed enterprises: 13 per cent reduced their activity costs, as many as 18 per cent increased their profits, 15 per cent increased their profitability and 11 per cent raised their labour productivity².

According to the Central Statistical Office's data, product and process innovations were introduced in the years 2006-2008 by more than 14.0% of industrial companies and over 12.0% of service providers in the group of small enterprises. In the medium-sized enterprise sector the percentages were even higher, exceeding 32.0% and 25.0%, respectively³. Slightly lower percentages of small enterprises invested in organisational innovations and the latest marketing solutions (in the group of industrial companies: 9.0% and 10.9%, respectively, and in the group of service providers: 12.0% and 11.9%, respectively). A similar tendency was observed for medium-sized enterprises – 19.8% of industrial enterprises and 24.1% of service providers invested in that period in organisational innovations, whereas 17.4% of industrial enterprises and 20.0% of service providers invested in innovative marketing solutions.

The above-mentioned survey results reveal the relevance of investment in innovative solutions. It should be noted that an enterprise's position in the market is affected to a large extent by its modern approach to management, which involves in particular constant investment in innovative solutions. As a result, such activities improve economic entities' competitiveness in the market. Innovative solutions may refer to: product quality, innovative technologies, customer service, pricing policy, methods of promotion and distribution or other factors affecting the efficiency of the enterprise's operations.

A study on innovative performance of Polish micro and small enterprises initiated in the 1990s revealed that it was still much worse than in most of the "old" EU member states⁴. One of the factors which were pointed out as the reasons for this condition was the low level of cooperation between industry and research. In order to intensify those relations, the Polish government in collaboration with the Polish Agency for Enterprise Development (PAED) initiated in 2008 a pilot programme known as the "2008-2011 Innovation Voucher". Its major objective is to encourage new relationships between entrepreneurs and scientific institutions. The studies carried out so far by the author as well as his relationships with micro, small and medium-sized enterprises in his consulting practice provide evidence for both poor innovative performance and insignificant relationships between SMEs and scientific institutions. In this context, the PAED's initiative to support the establishment of cooperation between selected enterprises and scientific institutions, in the author's opinion, seems to be both apt and necessary.

1.1 Programme beneficiaries

Since the results of the studies mentioned above had clearly revealed major discrepancies within the group of micro, small and medium-sized enterprises, with the latter having a much larger potential both financially and in terms of R&D, it was concluded that the "Innovation Voucher" Programme should be addressed to micro and small enterprises only. Like in the case of numerous other programmes part-financed by the state budget, it is required that those enterprises be based in Poland, whereas natural persons should be additionally Polish residents. In the author's opinion, the introduction of restricted requirements which the applicants need to meet was a right decision. Taking into consideration the eligible costs and the amount of financial support available within the "Innovation Voucher" Programme, both issues discussed below in detail, medium-sized enterprises themselves would have been uninterested in the programme or would have posed too strong competition for micro and small enterprises. Furthermore, medium-sized enterprises generally maintain more intense relationships with research and – as a consequence – in many cases fail to meet the additional condition defined in the guidelines. Namely, in order to emphasise the fact that new relationships need to be built between SMEs and scientific institutions, the Programme Guidelines allow funding to be granted to those entrepreneurs only who in the year of application and within 3 calendar years preceding the year of application for funds within the "Innovation Voucher" Programme have not been using R&D services delivered by a scientific institution in relation to product or technology implementation or development. Table 1 presents three main criteria which should be taken into account when classifying enterprises into three groups⁵.

Table 1. Classification of SMEs

Criterion Category of enterprise	Employment [persons]	Annual turnover [EUR millions]	Annual balance sheet total [EUR millions]
Micro	<10	<2	<2
Small	<50	<10	<10
Medium-sized	<250	<50	<43

The above-mentioned remarks refer to enterprises in the meaning of the Act of 2 July 2004 on Freedom of Economic Activity (published in the official Polish Journal of Laws No. 155 of 2007, item 1095 as amended). These are the basic criteria

¹ <http://www.pkpplewiatan.pl> (2011-12-29).

² Starczewska-Krzysztożek M., Innowacje chronią firmy przed skutkami kryzysu, "Rzeczpospolita" 2009, No. 297 p. B10.

³ <http://www.stat.gov.pl> (2011-12-29)

⁴ Jacek Lapiński, Paulina Zadura-Lichota, Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2011, s. 45.

⁵ Commission Regulation (EC) No. 800/2008 of 6 August 2008

whereas for the purpose of the appropriate classification an assumption needs to be made that a micro- or small entrepreneur be understood as a micro- or small entrepreneur meeting the conditions set in Annex I of the Commission Regulation (EC) No. 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General block exemption Regulation) (Official Journal of the European Union L 214 of 9 August 2008).

1.2 The amount of funding and eligible costs

The "Innovation Voucher" Programme allows a one-off funding of maximum PLN 15,000 for one enterprise over the years 2008-2011⁶. The list of eligible costs is limited and includes the purchase of services related to product or technology implementation or development, aimed at the development of new or enhancement of the existing technologies sold or products manufactured by the enterprise. The "Innovation Voucher" Programme was implemented in 2008 and ends in 2011. Its total budget for those three years was originally estimated for up to PLN 30 million. The total amount of funding and the number of applications recommended for funding by the PAED by years are presented in Table 2.

Table 2. Programme data for the years 2008-2011

Year	Number of applications recommended for funding	Total value of applications recommended for funding [PLN]
2008	24	360 000,00
2009	511	7 576 343,84
2010	463	6 933 387,64
2011	584	8 774 200,00

In most of the cases (1,539 out of 1,604 applications recommended for funding), scientific institutions estimated the value of the services they provided for enterprises at the maximum amount of eligible costs. It follows that in the majority of cases the financial support received was used with maximum efficiency. Other cases suggest that the financial support received helped the beneficiary to perform major implementations; the net value of the biggest one was estimated at PLN 69,995. The facts that only slightly more than a half of the budget in the years 2008-2011 was used and not a single application was recommended for funding in 2008 point to certain imperfections of the activities promoting the programme on the one hand, and on the other they reveal that the enterprises were not ready to apply for such resources. It is still more disturbing that the PAED as an implementing authority simplified the application procedures as much as possible.

1.3 Guidelines and procedures for applicants

The "Innovation Voucher" Programme is carried out on an annual basis and the PAED considers applications continuously until the total budget for a given year has been exhausted. The dates related to individual calls for applications are published on the PAED's website. The Applicant (the entrepreneur) selects a scientific institution – the Provider of the service related to product or technology implementation or development. Next, the Applicant prepares the application for funding according to the Programme Guidelines. The application form needs to be signed by authorised representative(s) of the Applicant. Several basic documents need to be attached (an extract or complete copy of the relevant (commercial) register records, a special form concerning application for de minimis aid, financial reports for the last three years compatible with the current accounting regulations should the Applicant be legally obliged to prepare them, information about de minimis aid should the Applicant have benefited from it in the current calendar year or in the last two calendar years). The enterprise fills in the application form, signs it, certifies the attachments to be true copies of the originals and checks whether all the necessary documents have been attached. Next, the application form with attachments is submitted to the PAED in one original and two photocopies certified by the Applicant to be true copies of the original. The

Agency considers the applications for funding on a continuous basis in the order of their submission. For each of the three years of the programme separate deadlines are set. Following the approval, the PAED submits two copies of the agreement to the Applicant. The Applicant signs the agreement and submits both copies back to the PAED within 14 days since the day the agreement has been delivered. The service related to product or technology implementation or development may be provided (by the scientific institution) to the Beneficiary (entrepreneur) after the application form has been submitted and recommended for funding. The service Provider issues an invoice for the actual value of the service delivered to the Beneficiary, and the entrepreneur pays the ineligible costs to the Provider's account. Next, the Beneficiary submits to the PAED all the documents essential to confirm the actual delivery of the service (payment request, service delivery report, copies of invoices and other documents confirming the payment of ineligible costs – all certified to be true copies of the originals). After the documents have been verified and accepted, the Agency transfers the payment within 30 days to the service Provider's account. If any irregularities should be observed in the enterprise's activities (errors in documents, failing to meet the timeline) it is held responsible for settling any amounts due to the service Provider. Even though the procedures were simplified as much as possible, they still have not been met in all the applications. As a result, in the years 2008-2009, 2010 and 2011, respectively, 73, 201 and 542 applications were rejected.

2 Cooperation between R&D and business

2.1 Scientific institutions – implementers

According to the rules of the "Innovation Voucher" Programme, its idea is to promote the cooperation between micro/small enterprises and scientific institutions in order to enable the exchange of knowledge concerning broad innovative solutions for companies. A scientific institution is defined in Art. 2.9a-f of the Act of 8 October 2004 on the Principles of Financing Science (published in the official Polish Journal of Laws No. 169 of 2008, item 1049) and in this meaning it needs to be based in Poland. Such an institution which provides a service to the beneficiary, where this service is related to product or technology implementation or development and is financed within the "Innovation Voucher" Programme, needs to be identified in the application form. Scientific institutions from the whole country may participate in the programme regardless of the region in which they are based – the beneficiary is free to choose a service provider from another region, there are no restrictions. This choice should be based on the institution's research potential and its technical capabilities on the one hand, and on the other it should assure good value for money. The entrepreneur is obliged to make this choice, order the service having chosen the best offer and make every effort to avoid potential conflict of interest so that the functions of each party are carried out without any bias or subjectivity. All those activities as a rule should be performed in writing, yet electronic mail and fax are allowed for activities other than the conclusion of the agreement. Given the fact that the majority of scientific institutions maintain vertical decision making structures, it is smaller institutions that became more competitive in their offers submitted in response to the requests for quotations concerning the delivery of the implementation service required.

2.2 University of Szczecin on the map of Polish scientific institutions

The University of Szczecin (US) has a very good location on the map of implementations within the "Innovation Voucher" Programme in Zachodniopomorskie and Lubuskie Voivodships (referring to the enterprise's registered office), and has made a certain appearance in Pomorskie, Wielkopolskie, Kujawsko-Pomorskie Voivodship. The University's shares in the implementations made in Poland and in selected voivodships in the years 2008-2011 are shown in Table 3.

⁶ "Innovation Voucher" pilot programme – guidelines for applicants, Warsaw: PAED 2008-2011

Table 3. The share of the University of Szczecin in the implementations made in the years 2008-2011 by the location of the enterprise's (Beneficiary in the "Innovation Voucher" Programme) registered office

Region	US's share		
	2008-2009	2010	2011
Kujawsko-Pomorskie	0.00 %	0.00 %	12.5%
Lubuskie Voivodship	0.00 %	25.00 %	8.33%
Pomorskie Voivodship	0.00 %	6.67 %	15.38%
Wielkopolskie	0.00 %	0.00 %	3.13%
Zachodniopomorskie Voivodship	29.17 %	34.38 %	28.21%
Poland	1.37 %	2.55 %	3.13%

The results for both Zachodniopomorskie and Lubuskie Voivodships point to the University of Szczecin as a leading scientific institution implementing innovative solutions in enterprises based in those regions. It is also noteworthy to observe that the share of the University of Szczecin in the implementations in 2010 increased as compared to the years 2008-2009 for both Zachodniopomorskie Voivodship and Poland. Another reason for high evaluations of the University of Szczecin is its presence on implementation markets in Kujawsko-Pomorskie, Lubuskie, Pomorskie and Wielkopolskie Voivodships.

2.3 Strengths and weaknesses of the "Innovation Voucher" Programme – evaluation based on selected implementations

All those aspects, along with a huge interest in the programme among entrepreneurs across the country, seem to indicate that the programme's idea to initiate relationships between entrepreneurs and science has proved to be very apt. The strengths of the "Innovation Voucher" Programme include: transparent and simplified procedures for applicants, a wide variety of services eligible for funding, a large number of potential service providers/scientific institutions, exclusion of medium-sized enterprises from potential SME beneficiaries, efficient "customer" service offered to beneficiaries by the PAED. In addition to all its strengths, the programme has also several weaknesses, including: poor promotion of the programme, low level of funding, changes in the documents within the call for projects. Against the strengths, however, the programme's weaknesses are only minor drawbacks which – in the author's opinion – do not affect significantly the general high evaluation this initiative definitely deserves.

2.4 Summary: real and potential benefits of the relationships established between SMEs and R&D

The benefits which resulted from the relationships established between entrepreneurs and the University of Szczecin were mutual. The companies were able to acquire knowledge about the most recent academic solutions applicable to business, while the academics were able to confront real problems of entrepreneurship and learn business rules used in practice. The implementations carried out in 2009 and 2010 indicate that in the majority of cases the relationships established were not incidental. Many beneficiaries of the "Innovation Voucher" Programme are still contacting the University of Szczecin, their former deliverer of implementations, for assistance in more or less complicated business problems. In many cases it has led to new contracts between the scientific institution and the enterprise. Those real benefits allow a positive outlook for the future: many other business problems may be solved by the human resources readily available at scientific institutions without the need to educate or employ new staff in the enterprise itself (outsourcing). Next, the companies as representatives of the business world may participate in panel discussions and conferences. And finally, researchers have an opportunity test their theories in real life – i.e. on micro and small enterprises.

Literature:

1. Commission Regulation (EC) No. 800/2008 of 6 August 2008.

2. <http://www.pkpplewiatan.pl> (2011-12-29).

3. <http://www.stat.gov.pl> (2011-12-29)

4. "Innovation Voucher" pilot programme – guidelines for applicants, Warsaw: PAED 2008-2011.

5. Łapiński J., Zadura-Lichota P., *Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce*, Warsaw: PAED 2008-2011.

6. Starczewska-Krzysztozek M., *Innowacje chronią firmy przed skutkami kryzysu*, "Rzeczpospolita" 2009, No. 297 p. B10.

Primary Paper Section: A

Secondary Paper Section: AE, AH

CREATIVITY AND ITS RELATION TO STRESS PERCEPTION

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Abstract: The article analyses the problems of the undergraduates' stress situation perception. The author looks for the differences of stress perception of highly and low creative respondents, and according to the results, she claims the less creative respondents perceive a lot more stress within their friendships (11,2 %) and their family relations (11,2 %) than more creative students (4,1 % and 7,2 %). On the contrary, more creative students feel more stress from health problems (15,5 %) than less creative ones (8,2 %). The least stressful situations for highly creative undergraduates are their friendships and anxiety states. The less creative respondents feel the least stress situations related to the anxiety states and unexpected situations.

Keywords: stress situations, creativity, differences in the stress situation perception

1 Creativity and Stress Situations

Creativity and stress situation coping are two phenomena, besides having more features in common, that are influenced also by some mutual factors, i.e. external and internal ones. In both cases we can talk about man's psychical functions and as well of his competences. We can say both phenomena are mutually determined and supported. Creativity is usually arisen during the process of solving a situation being unsolvable for a man in a used manner, and at the same time, this solution involves an active approach, that is an individual's creative activity. Considering these mentioned findings, we presuppose that the more creative an individual is the more active approach toward stress situation coping he/she should have, and then it also improves his/her life quality.

Our existing knowledge about creative activity importance for a man while considering stress situation perception and coping from his/her individual point of view, but also from a social-wide one had been the stimuli for our research. We have been inspired by research findings very rare in the Slovak, but also in the international setting (Amabile, 1996, Csikszentmihalyi, 1996, Kusá, 1996, 1997, 2000, 2004, 2006, Kováč, Matejčík, 1995, Kováč, 1996, 1998, 2000, Falát, 2001, Jurčová, 1998, 2000, 2005, Jurčová, Štubňová, 1999, 2004, Zelina a kol. 1996, Szobiova, 1998, 1999, 2001, 2004 and the others), but they point at the social importance of creativity very clearly, and at the intersections of creativity and social aspects.

Our aim was to analyze and to explain into more details the relations between creativity and stress situations. Creativity is understood in the professional literature as every man psychical manifestation enabling him/her to create new and useful values. We understand creativity to be a psychical function manifested in a system of personal characteristics, abilities and motivational tendencies of a man in his/her social context being new, unusual, acceptable and fecund for a subject, reference group or society (Szobiova, 2004; Kaliská, 2008). Every creative activity is influenced by a lot of factors determining the creativity level. Considering perused sources of basic factors determining creativity, we consider there to be personality features including cognitive processes, domain or skill, individual's expertise, individual's developmental stages and social conditions also within our work.

Stress situations are understood as situations when an individual is feeling the unbalance between the situational demands and own abilities or possibilities. They are the situations being dangerous, threatening for a man, and they induce stress and unpleasant experiences (Bratska, 1997; Oravcova, 2001).

2 Empirical Part

2.1 The research aim

Our research aim was to find out the stress situation perception of highly and low creative respondents, and also to find the differences between them.

2.2 The used methods

We have used for our research the Coping Strategy Inventory (CSI) by D.L. Tobin et. al. (1984). This inventory is based on several individual statements related to a concrete situation perceived by a respondent as a stressful one, and its description is also a part of the answering sheet. Besides measuring the individual differences in preferred coping strategies through CSI inventory, our aim was also to map stress situation types and their frequencies. The situation analysis of our research respondents' sample was categorized as it is mentioned in the chart below.

To find out the respondents' creativity level was applied Urban's figural test of creative thinking (TSD-Z) (Test zum schöpferischen denken – zeichnerisch – TSD – Z) used as a way to identify exceptionally highly creative abilities, but also to discover the individuals with below average creativity ability development; however being able to develop later on. Besides the cognitive components, the test respects also specific personality aspects such as risk taking, willingness to overcome the border, but also humor as an affective and emotional moment (Szobiova, 2004). The test is suitable for the four-year-old ones up to the late adulthood. The TSD-Z test author is Professor Hans G. Jellen realizing the first researches and modifications of this test in 1984-85.

2.3 Research sample description

Our research sample was formed by the 3rd year students of Faculty of Education, Faculty of Human Sciences, and Faculty of Natural Studies at Mathias Bell University in Banská Bystrica, Slovakia. They were future teachers of various study specialization of the external and internal form of study. The overall respondent's number was 379, 174 men and 205 women of them. To be able to compare highly and low creative respondents, we had divided them into the extreme groups according to the Urban's manual (2002). According to this division, we had found out there were 98 low creative respondents and 97 highly creative ones within our research sample.

The reason we chose this research sample had been, these respondents of all faculties were preparing themselves to be future teachers of primary and secondary school level. Forasmuch as they are going to form pupils' personality, and because of the fact their creative thinking and also stress situation coping are the most important competencies, we have aimed our research at this group of respondents. Besides this we realize the teacher's profession brings a lot of stress situations, and their coping asks for an active approach to be very often as a behavioral model for students.

2.4 Research results analyses and its interpretation

We have found out the answers of highly and low creative respondents vary (Table 1). The school and work stress situations were mentioned by both groups as the most frequent type of stress situations (49 situations, 50% by low creative ones, and 47 situations, 48,4% by more creative ones).

The second most frequent group for less creative ones are family problems and friendship problems (11 situation, 11,2%) and health problems for highly creative ones (15 situations, 15,5%).

The third most frequent group for both compared samples were stress types related to partnership problems (10 situations, 10,2% for low creative ones; 13 situations, 13,4% for highly creative ones).

The fourth category of listed stress types for less creative respondents was formed by situations related to health condition (8 situation, 8,2%), for highly creative ones by unexpected situations (9 situations, 9,3%).

There were ranked unexpected situations into the fifth listed group by low creative individuals (6 situations, 6,1%) and family problems for highly creative ones (7 situations, 7,2%).

The sixth listed stress situation category was covered by anxiety states by low creative ones (6 situations, 6,1%) and by friendship problems for highly creative ones (4 situations, 4,1%).

The seventh group was formed by stress types possessing frequency of less than 5 % for more creative respondents, and they were anxiety states (2 situations, 2,1%).

Table 1 Stress types of less and more creative respondents

variables	Low creative ones			Highly creative ones		
	n	%	Order	n	%	Order
School and work stress situations	49	50,0	1	47	48,4	1
Family problems	11	11,2	2	7	7,2	5
Partnership problems	10	10,2	3	13	13,4	3
Friendship problems	11	11,2	2	4	4,1	6
Unexpected situations	6	6,1	5	9	9,3	4
Health problems	8	8,2	4	15	15,5	2
Anxiety state	3	3,1	6	2	2,1	7
Total	98	100,0		97	100,0	

The differences of the mentioned stress situation types between individual respondents' groups were verified statistically by Mann-Whitney U-test. We found out the statistically significant difference at the significance level $p \leq 0,001$ between low and highly creative respondents (M-W 3556,5, $p \leq 0,001996$). According to these results, we conclude the less creative respondents perceive a lot more stress in their friendships (11,2 %) and their family relations (11,2 %) than more creative students (4,1 % and 7,2 %). On the contrary, we can claim that more creative students perceive more health problems (15,5 %) as stressful than less creative respondents (8,2 %). The least stress situations are friendships and anxiety states for them. The least stress situations of low creative respondents are related to the anxiety states and unexpected situations.

2.5 Conclusion

We have proved by our research sample that the school and work situations are being considered as the most frequent stress situations in the undergraduates' lives.

- The highly creative students considered their health problems as the most frequent stress situations, and their anxiety states and friendships are perceived as being stressful the least.
- The low creative students perceive the most stressful situations related to their faculty environment and outcomes during their study. They are being stressed

the least by their anxiety states and unexpected situations.

Recommendations for research and practice:

- To explore possible relations of found differences in students' stress situation types to their various creativity level with their personal characteristics.
- To explore other possible relations of highly frequent stress situations related to work and school problems of highly and low creative students.
- To aim research to relation exploration between stress types and used coping strategy types.
- Training program elaboration and realization for future teachers directed at creative approach toward stress situation coping with an emphasis at school and work setting.

Literature:

1. AMABILE, M. T.: *Creativity in Context*. Colorado, USA, Westview Press, 1996. 17 p. ISBN 0-8133-3034-33.
2. BRATSKÁ, M.: Konštruktívne riešenie a zvládanie situácií psychickej záťaže v skupine. In: *Psychológia a patopsychológia dieťaťa*. 32, No 2, 1997. p. 188 – 193, ISSN 0555-5574.
3. CSIKSZENTMIHALYI, M.: *Creativity*. New York, Harper Perennial, 1997. 456 p. ISBN 0-06-092820-4.
4. FALÁT, M.: Creativity as a Predictor of „good“ Coping? In: *Studia Psychologica*, 2000a. 42, No 4, p. 317 – 324, ISSN 0039-3320.
5. FALÁT, M.: Tvorivosť ako prediktor dobrého zvládania. In: Jurčová, M. (Ed). *Tvorivá osobnosť a jej kompetencie*. Bratislava: Ústav experimentálnej psychológie SAV, 2000. p. 67 – 75, ISBN 80-88910-04-8.
6. JURČOVÁ, M.: Humor and Creativity – Possibilities and Problems in Studying Humor. In: *Studia Psychologica*, 1998. 40, No 4, p. 312 – 316, ISSN 0039-3320.
7. JURČOVÁ, M.: Sociálna kompetentnosť tvorivých adolescentov. In: *Československá psychologie*. 2000. 44, No 6, p. 481-491, ISSN 0009-062X.
8. JURČOVÁ, M.: Creativity Research at The Institute of Experimental Psychology SASC – Areas, Topics, Methods and Findings. In: *Studia Psychologica*, 2004b. 47, No 4, ISSN 0039-3320.
9. JURČOVÁ, M., ŠTUBŇOVÁ, E.: Creativity and Social Competence of Adolescents. In: *Studia Psychologica*, 1999. 41, No 3, p. 193 – 202, ISSN 0039-3320.
10. JURČOVÁ, M., ŠTUBŇOVÁ, E.: Creative Climate to Whom Does it Fit Best and who Might Feel to be Threatened by it. In: *Studia Psychologica*, 2004. 46, No 1, p. 3 – 19, ISSN 0039-3320.
11. KALISKÁ, L.: Učebné štýly vo vzťahu k inteligencii, tvorivosti a školskej úspešnosti. Dizertačná práca. Nitra : FSVaZ Nitra.
12. KOVÁČ, T.: Tvorivosť, stres a niektoré aspekty zvládania ťažkostí. In: *Psychológia a patopsychológia dieťaťa*, 1996. 31, No 3, p. 238 – 243, ISSN 0039-3320.
13. KOVÁČ, T.: Creativity and Prosocial Behavior. In: *Studia Psychologica*, 1998a. 40, No 4, p. 326 – 330, ISSN 0039-3320.
14. KOVÁČ, T.: Vývinové (?) aspekty vzťahov niektorých faktorov tvorivosti. In: *Psychológia a patopsychológia dieťaťa*. 1998b. 33, No 3, p. 216 – 222, ISSN 0555-5574.
15. KOVÁČ, T.: Zvládanie školských problémov z pohľadu tvorivosti. In: *Psychológia a patopsychológia dieťaťa*. 2000. 35, No 1, p. 74 – 79, ISSN 0555-5574.
16. KOVÁČ, T., MATEJÍK, M.: Rozvíjanie tvorivosti detí a rodičov. In: *Psychológia a patopsychológia dieťaťa*. 1995. 30, No 1, p. 43 – 46, ISSN 0555-5574.
17. KUSÁ, D.: „Prosocial face“ of Conformity and Creativity in Adolescents. In: *Studia Psychologica*, 1996. 38, No 4, p. 225 – 232, ISSN 0039-3320.
18. KUSÁ, D.: Tvorivosť a bariéry sociálnej interakcie v adolescencii. In: RUISELOVÁ, Z. (Ed). *Bariéry kognitívnej a sociálnej adaptácie u adolescentov*. Bratislava: ÚEP SAV, 1997. p. 82-94, ISBN 80-889-1000-5.

19. KUSÁ, D.: Toward Creativity as a Potential for Social Competence. In: *Studia Psychologica*, 2000a. 42, No 3, p. 217 – 220, ISSN 0039-3320.
20. KUSÁ, D.: K problémom polarity a kvality vzťahu medzi tvorivosťou a konformitou. In: Jurčová, M. (Ed) *Tvorivá osobnosť a jej sociálna kompetencia*. Bratislava: UEP SAV, 2000b. 88 p. ISBN 80-88910-04-8.
21. KUSÁ, D.: Focusing on Recognized Creators: Dynamic Conception of Creativity and Creator. In: *Studia Psychologica*, 2004. 46, No 4, p. 297 – 304, ISSN 0039-3320.
22. KUSÁ, D.: Social Benefits of Being Creative: Creativity as a Positive deviance. In: *Studia Psychologica*, 2006. 48, No 3, p. 229 – 240, ISSN 0039-3320.
23. ORAVCOVÁ, J.: *Religiozita ako prostriedok zvládania psychickej záťaže*. Dizertačná práca, FF UK, Bratislava, 183 p. 2001.
24. SZOBIOVÁ, E.: Fenomén tvorivosti – základné pojmy a ich chápanie v retrospektíve dnes. In: *Československá psychologie*, 1998. XLII, No 6, p. 525 – 533, ISSN 0009-062X.
25. SZOBIOVÁ, E.: *Tvorivosť – od záhady k poznaniu*. Bratislava: Stimul, 1999. 282 p. ISBN 80-88982-05-7.
26. SZOBIOVÁ, E.: Vzťah tvorivosti a inteligencie: prieniky, podobnosti a odlišnosti. In: *Československá psychologie*, 2001. 45, No 4, p. 289 – 337, ISSN 0009-062X.
27. SZOBIOVÁ, E.: *Tvorivosť – od záhady k poznaniu (2. doplnené vydanie)*. Bratislava: Stimul, 2004. 371 p. ISBN 80-88982-72-3.
28. TOBIN, D. L., HOLROYD, K. A., REYNOLDS, R. V.: *User manual for the Coping Strategies inventory*. Ohio University 1984.
29. ZELINA, M., BOHONYOVÁ, M., ARBET, L.: Creativity, Humanization an Interaction Styles in Education. In: *Studia Psychologica*, 1996. 38, No 4, p. 215 – 223, ISSN 0039-3320.
30. URBAN, K. K., JELLEN, H. G., KOVÁČ, T.: Urbanov figurálny test tvorivého myslenia (TSD-Z). Bratislava: Psychodiagnostika, a. s., 57 p. 2002.

Primary Paper Section: A

Secondary Paper Section: AN

THE ROLE OF FLEXIBLE FORMS OF EMPLOYMENT IN POLAND

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Abstract: Modern organizations are increasingly eager to hire workers on the basis of flexible forms of employment. For the past few years Poland has also noticed increase in the share of temporary workers in the general structure of employment in organizations that increasingly use these solutions within the personnel function. This article aims to present the flexible forms of employment as a modern trend in the labour market based on the Polish example. In addition, it presents opportunities and risks of flexible forms of work from the perspective of the employee and the organization.

Keywords: flexible forms of employment, labor market.

1 Introduction

There have been significant developments in the area of human resource management in Poland in recent years. Contemporary organizations increasingly prefer employees with specialized knowledge and unique competencies, offering them a place in their structures. This place is not fixed for the functions and responsibilities, but is characterized by temporariness and transitivity. In Poland, despite the recent global economic crisis, there has not been a drastic decline in consumption and production. In fact, it has been otherwise. According to Central Statistical Office data PKB (Gross Domestic Product) in 2010 amounted to 3,8%. Better for last few years economic situation makes Polish organizations begin to seek workers who would constitute their competitive strength. However, special role is attached to temporary workers. It is indicated by Eurociett forecasts that in 2012 in Poland it is expected that the temporary employment market will rise by 26% compared to the previous year (report Eurociett 2011). In this context, the process of making employment flexible, which is an important indicator of changes in employment model, is beginning to gain special significance. Flexibility is a peculiar reaction to the uncertainty of the conditions of the organization and the inability to simply extrapolate the current way of functioning. It is also the most desirable feature of modern organization, an important determinant of its functioning and the determinant of its development (Krupski ed., 2008,p.9-10). In the literature there are several categories of atypical forms of employment and work organization, which include: teleworking, staff leasing, contracting work, self-employment, term contract, seasonal work, etc. These forms are not separable and employment characteristics of the individual can take one or more of them (Kryńska ed, 2003).

Also in Poland, for a few years we can observe more flexible employment process. Organizations are increasingly eager to use these solutions within the personnel function. However, this form of employment has its consequences, both in organizational and individual terms. Against this background, an attempt was made to present the flexible forms of employment as a modern trend in labour market, based on Polish example. In addition, opportunities and risks of flexible forms of work from the perspective of the employee and the organization were presented.

1.1 Changes in the employment and labour market in Poland

Over the past few decades the world has undergone major changes in labour market, in order to increase flexibility (Reilly,1998). The main sources of changes in labour-employment relations are primarily associated with changes in labour efficiency, globalization, the potential of the working and waiting for work, lengthening life, increasing the level of education, preferring a different model of family life and the rise in employment rate of women (Orczyk, 2004, p.124). For example, in mid-1980 in the United States there were about 100

temporary agencies. Currently, there are over 15 thousand agencies employing about 11 million people each year (Boyce, Ryan, Imus, Morgeson, 2007, p.6 for Berchem 2005). Although the flexible model of employment is most widespread in the United States and Western Europe, in recent years, it has been gaining increasing recognition in Poland as well (Ziółkowski, 2006, p.216). Discussions about changes in the patterns of employment in Poland should be sought with the transition from centrally planned to a capitalist economy. At this point we must mention that employment in Poland until 1989 was traditional and meant subordination of workers. This resulted from the contemporary economic system, in which the State provided a top-down equal access to jobs, regardless of the economic efficiency of enterprises. It is evidenced by the data of Central Statistical Office, which in Poland in the period before the political transformation showed the absence of unemployment.

The employment structure was dominated by structures based on labour relations, which provided a contract for an indefinite period, thus ensuring the need for worker safety in the workplace. Such employment model was, however, inadequate for actual contemporary demand for labour. The transition from centrally planned economy to a capitalist launched a number of mechanisms that affected the employment model in Poland. One (and most important) was so called 'Balcerowicz Plan' (the name of contemporary Deputy Prime Minister and Minister of Finance in Poland), that is a package of political and economic reforms. It should be noted, however, that at that time in Poland there was hyperinflation (annual rate of inflation in 1989-639.6%), foreign debt amounted to 42.3 billion dollars and there were huge shortages. The results of the plan included a significant reduction of inflation and budget deficit, which resulted in bankruptcy and liquidation of many public enterprises and reduction of employment in those which survived. The unemployment rate in 1993 reached the level of about 16.4%. On the other hand, many economists insisted that the Balcerowicz plan revealed only the actual level of unemployment that had occurred in a latent form ([www. http://pl.wikipedia.org/wiki/Plan_Balcerowicza](http://pl.wikipedia.org/wiki/Plan_Balcerowicza)).

The job market began to undergo an intense and permanent change, and organizations began to aim at more flexible organization of work and employment, which in turn resulted in increase in their capabilities and rapid response to changes in labour demand (Bohdziewicz, 2008,p. 107). These changes are also part of a contemporary popular concept of employment (Handy 1998, s.75-97, Sekula 2001, p. 16 et seq., Gableta2003, p. 127), which extracts the relatively homogeneous groups according to the criteria of the tasks / functions working conditions and wages (Antczak, p.251). It classifies workers into three segments. These include, according to the concept by M. Gablety: (Gableta, 2003, p.127):

- the core of the organization - employees of critical importance to the organization, with distinctive and specific knowledge, distinguishing particular organization from another; perform the tasks of a strategic nature,
- permanent workers – working in salaried positions, identify with the organization,
- peripheral workers – workers who are loosely related with the organization, characterized by easily replaceable competencies, which are available in labour market; employees based on various non-standard forms of flexible employment.

The structure of the individual staff will vary depending on the situation prevailing in the organization or its environment. According to M. Gablety the core crew definitely takes on the importance, without whom organizations cannot at present exist, the circle of loosely related workers, characterized by individuality compared to permanent workers, is widening. This results primarily from differences in forms of employment, the nature and durability of ties with the organization (Gableta, 2003, p.127). These ties are weakening today, which in turn results in atrophy of employee loyalty to the employer. Thus, participation of employees in achieving the objectives of the

organization takes on importance too (Bohdziewicz, 2008, p.123).

In conclusion it should be emphasized that the changes in the labour market in Poland are the result of: continuing trend related to preference for flexible employment rather than the traditional one, high labour costs charged to employers, increasing competition between companies, high percentage of graduates completing secondary and higher education, adverse demographic trends, increase in product and service innovation and the development of advanced technologies. We should also mention the changes proposed by the new government, to be an important instrument to fight the upcoming crisis in 2012, namely, the lengthening and alignment of activity to achieve the same retirement age for men and women amounting to 67 years. In this situation, to take temporary employment for many people in Poland is more and more often an alternative to permanent employment, while also an important instrument in the labour market, such as giving the opportunity to gain work experience.

1.2 Flexible forms of employment in Polish practice

Flexible forms of employment in Poland have their legitimacy apart from the European employment strategy and social policy in the "Strategy of development of the country 2007-2012", which is the primary and overarching strategic document setting out objectives and priorities for socio-economic development. Priorities adopted in this strategy determine the key and main directions of action, so that it will be possible to achieve the main objective. The first priority for the problem is priority No.3, which points to: "increase in employment and improvement of the quality of life; it clearly highlights the need to promote and apply flexible and alternative forms of employment on a larger scale as well as organization of time and working conditions." (Machol-Zajda, 2008, p.24).

A worker employed in Poland under flexible employment today is anchored in law. It should be noted that by 2004 the employment of temporary workers was governed by Article 298 of the Labour Code. It only signalled obligations of the firm, which used the services of temporary workers agency. This provision was repealed on January 1, 2004. The Act of 9 July 2003 on employment of temporary workers is currently in power. It contains more detailed tightened rules on hiring temporary workers by the employer, regardless of whether this is a temporary employment agency or a person employing temporary workers directly (Ziółkowski, 2006, p.228). In Poland, as the data indicate, 20% of temporary workers have secondary education, and only 15% have higher education. Therefore, the category of workers with primary education dominates. Thus, the distribution of the data differentiates Poland compared to other European countries where, for example, in Britain the proportions are reversed (www.jobexpress.pl/artykul/30/pracownik-tymczasowy).

However, as argued by A. Wicha, Director General of Adecco Poland, (the third largest share of temporary employment agencies in Poland in 2010) more and more often you can see changes in this trend. In addition to the permanent demand for workers of the production sphere, the development of service organizations occurs as well as the increase in demand for positions in departments such as call centres, telemarketing or office positions in the total number of employees (More specialists in temporary work, <http://www.egospodarka.pl/70817>, More-specialists-the-job-temporary, 1,39,1. html of 11 November 2011).

Temporary workers in Poland in 2010, worked out as much as 82 million hours of which 88% based on the contract of employment, while 12% of the hours were worked on the basis of civil contracts. For example, compared to 2009, the number of hours worked grew by 56% (www.admin.polskieforumhr.pl). This demonstrates the high popularity of this form of employment and understanding in the Polish society, it is an opportunity for professional activation, in particular, for those remaining unemployed for a long time. It should also be noted that among temporary workers, in the same period, in the age structure the highest percentage of 51% accounted for workers

under 26 years. However, there are only few of 50+, who seem not to be interested in this form due to the fact that they have minimum social security assured, either in the form of a pension or annuity. On the other hand, unfortunately, employers interested in temporary workers decide to recruit and even train younger rather than older people.

Regarding the positions, in Poland as much as 70% are employed in manufacturing jobs, in sectors such as automotive, light engineering, food and tobacco, transport and logistics, and pharmaceuticals. As indicated by the figures for 2009 making a contract does not exceed 30 days, which taking into account the length of contracts for temporary workers in other European countries is, along with Italy, one of the largest. For example, the longest contracts are concluded with temporary agency workers in Sweden, Germany and Austria (Ciett Economic Report 2011). However, we can be positive about the fact that temporary work greatly increases chances for workers in Polish labour market, where today nearly 20% of temporary workers are employed permanently (www.admin.polskieforumhr.pl).

In Poland, since 2000 several conferences have been organized, dozens of studies have been conducted in this area, also dozens of scientific publications have been created and a number of research programs have been implemented under the European Social Fund, for example, the Integrated Regional Operational Programme (Dobrowolska ed., 2006) on flexible forms of employment, their forms, consequences and effects from the perspective of both organization and individual.

Postulates formulated by Spytek-Bandurska and Szyłko-Skoczny regarding temporary work in Poland seem to be interesting, which implementation can contribute to this form of work. These include among others: (Spytek-Bandurska, Szyłko-Skoczny, 2008, pp.283-288)

1. Temporary work should be seen as a multifaceted phenomenon, due to the functions it can perform. The interests of employers and potential employees must be reconciled.
2. The perception of temporary work must be changed, considered by staff primarily through the implementation of an unattractive form of flexicurity which combines, in optimal proportions, flexibility with employment security, understood as the need for skills development and ideas of learning throughout life.
3. Ability to create trade unions for temporary workers.
4. The need to modify the laws governing the institution of temporary work. One important barrier is the accepted limit for performing work for a single user employer. It would be reasonable to extend the limit or completely abolish it.
5. We must reduce bureaucracy and simplify the performance of many obligations which employment agencies meet, e.g. agencies must keep a record of employee for 50 years.
6. Improving quality of services provided by temporary work agencies.
7. Strengthening social safety of temporary workers, which involves their employment stability.
8. Creating own codes of ethics aimed at building a unified and coherent policy to respect the employer's and employee's temporary interests.
9. Ensuring a better relationship between private and public institutional sector operating labour market, which should be based on complementarity, competitiveness and cooperation.
10. The agency certification criteria should be reinforced. Currently, new entities are not e.g. checked for financial reliability and capacity to conduct such activities.

The above presented postulates are necessary in a situation of increasing scope of changes and uncertainty and creating an organizational environment conducive to a potential employee. They also do not lose their importance today, and contrary, will be to a greater extent in the centre of attention especially to the growing interest in flexible forms of employment in Poland from both employers and employees.

1.3 Opportunities and risks of flexible labour market in Poland

It is not possible to consider the general opportunities and threats in relation to flexible labour market due to the multiplicity of solutions, which provide different effects. We should also

separately analyze the advantages and disadvantages in the labour market flexibility, both from the perspective of the employer and the employee (D. Głogosz, 2007, p.60). Below we have a synthesis of advantages and disadvantages of flexible employment from the employee and employer perspective.

	Employee	Employer
A D V A N T A G E S	<ul style="list-style-type: none"> the possibility of combining non-professional and professional life (more time for family, own interest or education and skills) higher satisfaction from work possibility of acquiring new knowledge, through its participation in the implementation of tasks in different companies, acquiring work experience, increase in flexibility in the implementation of tasks and shaping the conditions of employment, opportunity to perform work for several employers at the same time. 	<ul style="list-style-type: none"> lowering the cost of workplace organization, higher productivity efficiency of employees, better customer service better access to employees greater employment opportunities for appropriate staff, eliminating stress connected with the need to use emergency solutions, better control over employees, more efficient use of work time, diffusion of knowledge, short time of recruitment, adjusting the number of employees to the changing circumstances of the organization.
D I S A D V A N T A G E S	<ul style="list-style-type: none"> less job security, lower wages, no guaranteed minimum wage and employee benefits, weak friendship ties and contacts with the work environment by being isolated by the full-time employees, blurring of boundaries between work time and time off work, difficult access to information about what is happening in the company, difficulties to comply with professional duties, especially in the case of new untested organizational solutions, low motivation to work due to short periods of employment and wages, inability to associate in trade unions 	<ul style="list-style-type: none"> cost of organizing the workplace costs of training, management and supervision, costs of administrative changes, atomization of labour relations, possible transient inferior quality of work, high levels of employee turnover, the possibility of losing competitive advantage due to the lack of loyalty, the possibility of conflicts between permanent staff and "the flexible", reduced protection of secret information organization, deficit of desired employees in the period of increased demand for labour.

Source: own study based on Głogosz, 2006, p.67, Dobrowolska 2006, Ziółkowski, 2006, p.228, Juchnowicz, 2009, p.35-48, Sadowska-Snarska ed., 2008, pp.152-160

Examples presented in the table represent the most important advantages and disadvantages of flexible employment from the perspective of employers and employees. Referring them to the functioning of the of Polish labour market, the most important factor conducive to positive perceptions flexibility in the areas of employment by employers is primarily reducing labour costs, which from 2000 to 2009 have nearly doubled (Statistical Pocketbook 2011), and adjusting the number of employees to changing situation of the organization. In this situation, employers are increasingly using the services of temporary work agencies employing workers on the basis of atypical forms of work rather than create new (full-time) jobs. From the perspective of a Polish employee, flexible form of employment is an opportunity to gain work experience-especially in the case of a graduate, is an opportunity for employment in regions with high rate of unemployment, is a way to avoid being excluded from the community and the possibility to use the key competencies of employees and, which was previously highlighted, in Poland workers with university education are increasingly employed for specialized positions. It is also an opportunity to gain permanent employment by increasing jurisdictional competitiveness in people taking temporary work. Unfortunately, this form of employment also has its negative aspects. In Poland there is still a belief in the superiority of the "permanent" over temporary employment, which is associated with a lack of legal regulations relating to the lack of a guaranteed minimum wage, employee benefits, inability to associate in trade unions and the concept of the working day adopted in the Polish legislation. In accordance with Article 128 paragraph 3 point 1 of the Polish Labour Code a day should be understood by 24 consecutive hours, from the hour at which the employee starts work according to his working schedule. Such a provision has deprived the employee of free and convenient shaping distribution of time. People undertaking flexible employment in Poland are also discriminated against when applying for bank loan for example. There is also a stereotype that a person taking a flexible employment is qualitatively worse, has poor qualifications, because if it was the opposite one could get "fixed" time.

The negative implications of changes in the employment model from the perspective of employers are high costs associated with the implementation the employee to the tasks assigned in organization, high levels of job rotation (associated with the provision in the Polish Labour Code) and a lack of loyalty of employees reflected in unethical behaviour.

1.4 Conclusion

Flexibility is a feature, which increasingly includes the sphere of functioning of the organization. Also in Poland the development of flexible employment is promoted as an alternative to permanent employment. It is also an important instrument of increasing the dynamics of people taking their own professional activity and translates into the economic situation of the country even exemplified by Polish economic growth.

Although Poland is convinced that flexible forms of employment are unattractive from the perspective of the employee, we should overcome these barriers and promote such solutions, e.g. in the Polish Labour Code, which would increase the percentage of employment, and thus affect popularity of these forms not only from the employer's perspective.

Topics discussed due to the limited volume of studies certainly does not explore all aspects of flexible forms of employment in Poland. However, the problem discussed tends to take a broader analysis and impact assessment from both economic and psychosocial perspective with particular emphasis on the individual at the heart of research interests.

Literature:

1. Antczak Z., *Praca w społeczeństwie wiedzy - rozważania diagnozujące przeobrażenia wybranych zakresów znaczeniowych pojęcia pracy*, w: *Człowiek i praca w zmieniającej się organizacji*, ed. Gableta M., Pietron-Pyszczyk A., Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2009. 519 p. ISBN 978-83-7011-956-0.

2. Bohdziewicz P., *Kariery zawodowe w gospodarce opartej na wiedzy (na przykładzie grupy zawodowej informatyków)*, Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2008. 394 p. ISBN 978-83-7525-240-8.
3. Boyce A.S., Ryan A.M., Imus A.L., Morgeson F.P., *Temporary Worker, Permanent Loser? A Model of the Stigmatization of Temporary Workers*, Journal of Management February 2007. Vol.33, No 1, ISSN 0149-2063.
3. Ciett Economic Report 2011.
4. Dobrowolska M. ed. *Być albo nie być czasownikiem. Analiza funkcjonowania pracownika w warunkach zatrudnienia tymczasowego*, Materiały konferencyjne, Katowice: „Śląsk” Wydawnictwo Naukowe, 2006. 280 p. ISBN 978-83-7164-507-5
5. Gableta M. *Człowiek i praca w zmieniającym się przedsiębiorstwie*, Wrocław. Wydawnictwo Akademii Ekonomicznej we Wrocławiu. 2003. 229 p. ISBN 83-70116-24-8.
6. Głogosz D., *Elastyczność na rynku pracy – potrzeba czy konieczność?*, w: *Elastyczne formy pracy. Poradnik dla pracodawców*, ed. Machol-Zajda L., Głogosz D., Sadowska-Snarska C., Białystok: Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku, 2007. 236 p. ISBN 978-83-9288-838-3.
7. Juchnowicz M. *Zaangażowanie pracowników poprzez zaufanie*, w: *Człowiek i praca w zmieniającej się organizacji*, ed. Gableta M., Pietroń-Pyszczek A., Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2009. 519 p. ISBN 978-83-7011-956-0.
8. Krupski R., *Elastyczność organizacji*, Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2008. 224 p. ISBN 978-83-7011-909-6.
9. Kryńska E. ed. *Elastyczne formy zatrudnienia i organizacji pracy a popyt na pracę w Polsce*, Warszawa: Instytut Pracy i Spraw Socjalnych, 2003. 263 p. ISBN 83-87890-42-1.
10. Machol-Zajda L., *Rozwój elastycznych form pracy*, Zarządzanie Zasobami Ludzkimi 2008 Nr 5 (64), ISSN 1641-0874.
11. More specialists in temporary work, <http://www.egospodarka.pl/70817,More-specialists-the-job-temporary,1,39,1.html> of 11 November 2011.
12. Orczyk J., *Zmiany zakresu pojęcia „praca” a zatrudnienie*, w: *Zarządzanie zasobami ludzkimi w warunkach nowej gospodarki*, ed. Z. Wiśniewski, A. Pocztownski, Kraków: Oficyna Ekonomiczna, 2004. 371 p. ISBN 83-89355-26-4.
13. Reilly, P.A., *Balancing flexibility – meeting the interests of employer and employee*, European Journal of Work and Organizational Psychology, 1998 Vol. 7. Issue 1, ISSN 1464-0643.
14. Report Eurociett 2011.
15. Sadowska-Snarska C.ed. *Elastyczne formy pracy. Szanse i zagrożenia*, Białystok: Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku, 2008. Wyd. WSE w Białymstoku, Białystok 2008. 220 p. ISBN 978-83-8798-192-1.
16. Sekuła Z. *Planowanie zatrudnienia*, Warszawa: Oficyna Ekonomiczna, Dom Wydawniczy ABC, 2001. 250 p. ISBN 83-88597-47-7.
17. Spytek-Bandurska G., Szyłko-Skoczny M., *Praca tymczasowa. Szanse i zagrożenia*, Warszawa: Dom Wydawniczy Elipsa, 2009. 317 p. ISBN 978-83-7151-844-7.
18. www.admin.polskieforumhr.pl dated 13.11.2011.
19. www.jobexpress.pl/artykul/30/pracownik-tymczasowy dated 13.11.2011.
20. [www. http://pl.wikipedia.org/wiki/Plan_Balcerowicza](http://pl.wikipedia.org/wiki/Plan_Balcerowicza) dated 12.11.2011.
21. Ziolkowski, *Alternatywne formy zatrudnienia pracowników*, w: *Nowe tendencje i wyzwania w zarządzaniu personelem*, ed. L. Zbiegień-Maciąg, Kraków: Oficyna Ekonomiczna, Wolters Kluwer, 2006. 288 p. ISBN 83-74840-28-5.

Primary Paper Section: A

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THE INFLUENCE OF MICROECONOMIC FACTORS ON INVESTMENT EXTERNAL FINANCING IN POLISH QUOTED METALS COMPANIES

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The company's abilities to finance the investment from external capital are conditioned by heterogeneous factors. In this paper the research attention was concentrated on microeconomic factors, as those elements which might be dependent on the company's decisions. The principal purpose of this paper was to define the impact of microeconomic factors on external financing of investment in Polish quoted metals companies in period 1997-2010. Research expectations, as well as the empirical verification was based on the pecking order theory. Results obtained confirmed the thesis of microeconomic factors' relevance on investment's external financing in Polish quoted metals companies.

Keywords: investment external financing, microeconomic factors, quoted metals companies, pecking order theory

1 Introduction

Investment activity is determined to a large extent by the financial resources which are at the company's disposal and also might be gained from various capital sources. The process of covering financial needs connected with investment requires the capital engagement on the level which generally surpasses the company self-financing abilities. It usually involves the necessity of external capital usage. The investment significance in the company's development determines in the context above the importance of issues connected with investment's external financing, which consequently should be considered as one of the essential part of the company value growth. It should be emphasized at the same time that the company's abilities to finance the investment from external capital are conditioned by heterogeneous factors, inter alia microeconomic.

Particular investment position in the company implies the importance of researches related to the microeconomic factors identification, as well as the recognition both the strength and the direction of their influence on investment's external financing. Hence, in this paper, the principal goal was to define the impact of microeconomic factors on external financing of investment, on the basis of Polish quoted metals companies. Theoretical research considerations, as well as empirical were based on the pecking order theory, which was created by Myers and Majluf (1984). According to the theory in question, in the conditions of information asymmetry which exists on imperfect financial market, the company intends to reduce the investment inefficiency by the selection of capital in determined order¹. It states that the company first of all prefers internal capital, but in the necessity of external capital usage, the company prefers credits and bonds issues to shares issues. The confirmation of these thesis was obtained in many empirical studies which were conducted, among others by Shapiro (1990)², Rajan and Zingales (1995)³, Harris and Raviv (1991)⁴, Gajdka (2002)⁵, Zygmunt (2009)⁶.

¹ See more: Myers S.C., Majluf, N. *Corporate Financing and Investment. When Firms Have Information that Investors Do Not Have*. "Journal of Financial Economics", vol. 13, 1984, 187-221 p. ISSN: 0304-405X.

² See more: Shapiro, A.C. *Modern Corporate Finance*. New York: Mcmillan Publishing Company, 1990. 484 p. ISBN 0024095303.

³ See more: Rajan, R.G., Zingales, L. *What do we know about capital structure? Some evidence from international data*. "Journal of Finance", vol. 50, 1995. 1421-1460 p. ISSN 1540-6261.

⁴ See more: Harris, M., Raviv, A. *The theory of capital structure*. "Journal of Finance", vol. 46, 1991. 297-355 p. ISSN 1540-6261.

⁵ See more: Gajdka, J. *Teoria struktury kapitału i ich aplikacja w warunkach polskich*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2002. 230-248 p. ISBN 8371715803.

⁶ See more: Zygmunt, J. *Polish companies financing in consideration of the pecking order theory* [in:] scientific editor: Dytczak, M., *The prospects of scientific and economic collaboration European Union and China in XXI century. Multi- aspect cooperation the European Union and China, Studia i Monografie*. Z. 249, Opole: Oficyna Wydawnicza Politechniki Opolskiej, 2009. 147-152 p. ISBN 978-83-60691-64-9.

2 Microeconomic factors of investment external financing – identification and research expectations

The investment financing might be sensitive to microeconomic factors. Both the strength and the range of above-mentioned factors on investment's external financing are generally dependent on the decisions which are made in the company. On the basis of theoretical studies results, it should be indicated that first of all the most common microeconomic factors are: the possibility to financial leverage effects usage, the company size and its market position, as well as the company's financial standing⁷. Besides, in the light of considerations conducted in this paper, it appears relevant to include into the microeconomic factors such elements as the investment's activity scale and the company's growth potential.

The impact of microeconomic factors on investment's external financing might be diverse. In this paper, the research expectations were expressed on the basis of the pecking order theory and are described as follows:

In accordance to the pecking order theory, the absence of entire substitution between external and internal financing is reflected in the preference of capital which originated from internal sources⁸. From this point of view, it might be expected that the company will not entirely benefit from the financial leverage effects which display in increasing the return on equity as the consequence of external capital usage⁹. Moreover, as emphasize Hamrol and Filipczyk (2004), the essential influence of financial leverage on the company flexibility is noticeable in larger companies in a low level of this leverage¹⁰. Thereby, it might be anticipated that the decrease in financial leverage effects is accompanied by the decrease in the scope of investment's external financing.

It should be also remarked that the researches conducted, among others, by Rajan and Zingales (1995) lead to the conclusion that the information asymmetry level is higher in larger companies¹¹. On the base of the pecking order theory, it should be notified that the increase of information asymmetry entails the intensification of internal capital usage in the company's financial structure. Therefore, it might be assumed that the company's size growth will be connected with decreasing in the range of investment's external financing.

Taking the company's market position into consideration it should be said, that its high position is often conducive to external capital gaining. At the same time, it should be remarked that the company's activities directed to market expansion express usually the necessity of various investment realization, what might imply the need to capital involvement on the level which surpasses the company self-financing abilities. In this context it is assumed that the increase in the company's market position corresponds with higher level of investment's external financing.

⁷ See more among others: Rutkowski, A. *Zarządzanie finansami*. Warszawa: Polskie Wydawnictwo Ekonomiczne, 2000. 241-243 p. ISBN 832081278X; Szczepankowski, P.J. *Zarządzanie finansami przedsiębiorstwa*. Warszawa: Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarządzania im. Leona Koźmińskiego, 2004. 92-95 p. ISBN 8389437171; Zygmunt, A., *Determinanty struktury kapitału przedsiębiorstw należących do branży przemysłu elektromaszynowego (w świetle badań empirycznych* [in:] scientific editor Kopiński, A., *Finanse przedsiębiorstw*. Wrocław: Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu nr 98, 2010. 442-448 p. ISBN 978-83-7695-001-3; Norton, E. *Factors Affecting Capital Structure Decisions*. "Financial Review", vol. 26(3), 1991. 431-446 p. ISSN 1540-6288.

⁸ Myers, S.C., Majluf, N. *Corporate Financing and Investment. When Firms Have Information that Investors Do Not Have*. "Journal of Financial Economics", vol. 13, 1984. 187-221 p. ISSN: 0304-405X.

⁹ With the exception of share capital.

¹⁰ Hamrol, M., Filipczyk, A. *Czynniki determinujące strukturę kapitału przedsiębiorstwa. Teoria i praktyka*, [in:] scientific editor: Zarzecki, D. *Zarządzanie finansami przedsiębiorstw w Unii Europejskiej*, tom I. Szczecin: Fundacja na rzecz Uniwersytetu Szczecińskiego, 2004. 253 p. ISBN 8389142252.

¹¹ Rajan, R.G., Zingales L. *What do we know about capital structure? Some evidence from international data*. "Journal of Finance", vol. 50, 1995. 1421-1460 p. ISSN 1540-6261.

On the grounds of the pecking order theory, it should be enhanced that the company's good financial standing might be the principal premise of investment's needs covering from internal capital, which may allow to reduce the information asymmetry. Above conclusion was verified *inter alia* by Shapiro (1990), Gajdka (2002), Skowroński (2002)¹², who on the base of profitability criterion concluded that companies with good financing standing generally use internal capital. For that reason it is expected that the company's good financial standing involves the smaller external capital application in investment activities.

It should be emphasized that the realization of investment on certain size is integrally related to indispensability of capital insurance. In the situation when the company accomplishes investment on very large scope, it might be connected with accelerated request for capital, especially external. Hence, it is expected that the investment's activity scale enhancement will correspond to higher level of investment's external financing. Similarly, it is assumed that the high company's growth potential is accompanied by the increase in external financing of investment.

3 The Empirical verification of microeconomic factors influence on investment external financing

Polish metals sector includes dozen companies with almost 33 000 employees¹³. In 2010 year, the financial net result was negative with the amount of circa 132 milion PLN, and investment expenditures of 607 milion PLN¹⁴. Metals sector in Poland faces the rigorous requirements connected with environmental protection. There is said that relatively high infrastructural investment accomplishment in Poland will be the ground for metals sector development¹⁵.

The empirical research over the impact of microeconomic factors on investment's external financing were conducted on these metals companies which were continuously quoted on Warsaw Stock Exchange between the years 1997-2010. The research sample includes all the companies which fulfilled the foregoing condition and contains the following companies: Ferrum S.A., Grupa Kęty S.A., Hutmen S.A., Impexmetal S.A., Stalprodukt S.A.

Dependence description between external financing of investment and microeconomic factors was conducted on the basis of Pearson correlation coefficient. Identification of the connections between variables was carried out by the usage of the linear regression models represented as follows¹⁶:

$$Y = \alpha_0 + \alpha_1 x + \varepsilon \quad (1)$$

where:

Y – dependent variable,

α_1 – correlation coefficient variable Y in relation to variable X,

α_0 – intercept,

x – independent variable,

ε – error term.

The estimations of models' parameters were conducted by the usage of ordinary least squares method. Dependent variable (Y) represents the level of external financing of investment in polish quoted metals companies. In the process of dependent variable

definition, there was employed the pecking order theory, which indicates that the company's capital structure depends on the ways in which the investment are financing¹⁷. Hence, dependent variable was determined as the external capital contribution to the company's capital structure.

Independent variables were established on the basis of theoretical studies outcomes which were discussed previously in this paper. The company financial standing complexity implied the requirement of various variables usage to describe the standing in question. As a result, independent variables were determined as follows:

- X1 – company size (\log_e of net sales),
- X2 – company market position (ratio between net sales and total assets),
- X3 – financial leverage (ratio between return on equity and return on total capital assets),
- X4_A – return on assets (ratio between net financial result and total assets),
- X4_B – return on equity (ratio between net financial result and equity),
- X4_C – return on sales (ratio between net financial result and net sales),
- X4_D – current liquidity ratio (ratio between current assets and current liabilities),
- X4_E – cash ratio (ratio between cash flows from operating activities and current liabilities),
- X4_F – cash sufficiency for indebtedness repayment (ratio between cash flows from operating activities and total liabilities),
- X4_G – capability to debt-service (ratio between the sum of earnings before interest and tax to interest),
- X5 – company growth potential (ratio between investment expenditures and total assets),
- X6 – investment activity scale (ratio investment assets and total assets).

Preliminary tests proved the there is the evidence of strong random dependence¹⁸ between variables X4_A and X4_B, X4_A and X4_C, X4_B and X4_C, as well as between X4_E and X4_F. Relatively high multicollinearity between above variables entailed the necessity for variables exclusion (X4_A, X4_B, X4_E). Finally, definite group of independent variables includes: X1, X2, X3, X4_C, X4_D, X4_F, X4_G, X5, X6.

To identify those independent variables which are in significant relation to dependent variable, there was used the Pearson correlation coefficient. It was considered at the same time that the influence of independent variables on dependent variable might be delayed. T-Student test with n-(k+1) degrees of freedom was employed to verify the relationships significance between independent variables and dependent variable. The research results allow to conclude that¹⁹:

- variables X3, X4_D, X4_G and X5 had the highest dependence with variable Y in period t,
- for variables X2 and X4_F which were one period delayed, the Pearson correlation coefficients with variable Y were the highest,
- for two periods delay, variables X1, X4_C and X6 influenced on variable Y stronger than in period t or period t-1.

Variables X1_{t-2}, X3_t, X4_{C t-2}, X4_{D t} as well as variable X4_{F t-1} were statistical significant in relation to variable Y, and were the object of further studies over the influence of microeconomic factors on investment's external financing in polish quoted metals companies. The results of estimation both Pearson

¹² Skowroński, A. *Kształtowanie struktury kapitału jako przedmiot decyzji finansowych* [in:] scientific editor: SOBIECH, J. *Kapitałowa strategia przedsiębiorstwa*. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu, 2002. 59-73 p. ISBN 8388760971.

¹³ See more: *Polska 2011 raport o stanie gospodarki*. Warszawa: Ministerstwo Gospodarki, Departament Analiz i Prognoz, 2011. 153-154 p. <http://www.mg.gov.pl/files/upload/8436/RoG2011.pdf>, accessed November 20, 2011. ISSN 1429-3005.

¹⁴ See more: *Ibidem*.

¹⁵ See more: *Ibidem*.

¹⁶ Ignatczyk, W., Chromińska, M. *Statystyka: teoria i zastosowanie*. Poznań: Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu, 1998. 165 p. ISBN 8372050333.

¹⁷ See more: Gajdka, J. *Teorie struktury kapitału i ich aplikacja w warunkach polskich*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2002. 236-243 p. ISBN 8371715803.

¹⁸ When $|R| > 0.9$.

¹⁹ for further delays than two periods, the dependence strength between independent variables and dependent variable was minor or statistical insignificant.

correlation coefficients and linear regression models are shown in table 1.

Variable	R	R ²	$\hat{\alpha}_i$	t _{ei}	p-value	
X1 _{t-2}	-0.6883	0.4738	$\hat{\alpha}_0$	3.8357	3.4640	0.00608153
			$\hat{\alpha}_1$	-0.1662	-3.0007	0.01332716
X3 _t	0.7448	0.5547	$\hat{\alpha}_0$	0.3803	11.2171	0.0102*10 ⁻⁵
			$\hat{\alpha}_1$	0.0851	3.8661	0.00224371
X4C _{t-2}	-0.6218	0.3867	$\hat{\alpha}_0$	0.5466	25.3058	0.0213*10 ⁻⁸
			$\hat{\alpha}_1$	-0.5671	-2.5110	0.03086072
X4D _t	-0.7856	0.6171	$\hat{\alpha}_0$	0.6859	15.5394	0.0259*10 ⁻⁷
			$\hat{\alpha}_1$	-0.1235	-4.3981	0.0868*10 ⁻²
X4F _{t-1}	-0.8011	0.6418	$\hat{\alpha}_0$	0.5963	25.0054	0.0481*10 ⁻⁹
			$\hat{\alpha}_1$	-0.3519	-4.4398	0.0995*10 ⁻²

Table 1. Pearson correlation and linear regression estimation results. Source: own empirical studies.

The results displayed in table 1 enable to emphasize that estimated models have the reasonable adjustment to empirical data, with the exception of models related to independent variables X1_{t-2} and X4C_{t-2}, for whose coefficient of determination proved that they in relatively restrained degree explain the changeability of variable Y. The models' structural parameters significance was confirmed on the basis of t-Student test. On the basis of Durbin-Watson test it might be concluded that there was no evidence of error term's autocorrelation.

Empirical studies provide the conclusion which is consistent with the observations of Shapiro (1990), Gajdka (2002) and Skowroński (2002) concerning the company's financial standing. The studies allow to remark that financial standing of polish quoted metals companies is argued to have the important influence on the level of external financing of investment. The dependence direction is consistent with the research assumptions based on the pecking order theory and enables to indicate that good financial standing of companies in question determines the reduction of external financing of investment for the benefit of internal financing usage. According to the studies results, it should also be noticed the significant relationship between the level of external financing of investment in polish quoted metals companies and their size. Contrary to expectations, the dependence direction indicates that the company's size growth corresponds to the increase in the level of external financing of investment. Subsequently, there is meaningful dependence between the company's financial leverage and the level of external financing of investment in polish quoted metals companies. The empirical results in this field are in compliance with research assumptions and predestine to conclude that together with the financial level increase, the level of external financing of investment enlarges.

4 Conclusions

The principal goal of this paper was to define the impact of microeconomic factors on investment's external financing in polish quoted metal companies. Both theoretical and empirical research results indicate that the external financing of investment in polish quoted metals companies is conditioned by various microeconomic factors. Empirical results proved that for those companies there is the evidence of statistically significant sensitivity of investment's external financing to such

microeconomic factors as: financial leverage, company's size and financial standing. The dependence direction was diverse. The microeconomic factors were sometimes characterized by the delayed influence on investment's external financing. Moreover, it should be pointed out that the level of external capital usage to investment's needs covering in companies in question was irrespective to their market position, growth potential, and also investment's activity scale.

The investment significance in the company's development determines the necessity for further research. It appears that the subject of these studies should focus first of all on the verification if the relations occurred in quoted metals companies are coherent for those metals companies in Poland which are not quoted. It seems also important to disclose the matter of information asymmetry influence on the above mentioned relationships. Furthermore, there is the need noticeable to use panel data analysis method to examine the results obtained. Since the external investment financing of polish quoted metals companies might be determined not only by microeconomic factors, the further researches should also concentrate on the identification of macroeconomic factors which affect the financing in question, as well as such factors as for instance the managers' attitude towards financial and investment risk.

Literature:

- Gajdka, J. *Teorie struktury kapitału i ich aplikacja w warunkach polskich*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2002. 230-248 p. ISBN 8371715803.
- Hamrol, M., Filipczyk, A. *Czynniki determinujące strukturę kapitału przedsiębiorstwa. Teoria a praktyka*, [in:] scientific editor: Zarzecki, D. *Zarządzanie finansami przedsiębiorstw w Unii Europejskiej*, tom I. Szczecin: Fundacja na rzecz Uniwersytetu Szczecińskiego, 2004. 253 p. ISBN 8389142252.
- Harris, M., Raviv, A. *The theory of capital structure*. "Journal of Finance", vol. 46, 1991. 297-355 p. ISSN 1540-6261.
- Ignatczyk, W., Chromińska, M. *Statystyka: teoria i zastosowanie*. Poznań: Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu, 1998. 165 p. ISBN 8372050333.
- Myers, S.C., Majluf, N. *Corporate Financing and Investment. When Firms Have Information that Investors Do Not Have*. "Journal of Financial Economics", vol. 13, 1984, 187-221 p. ISSN: 0304-405X.
- Norton, E. *Factors Affecting Capital Structure Decisions*. "Financial Review", vol. 26(3), 1991. 431-446 p. ISSN 1540-6288.
- Polska 2011 raport o stanie gospodarki*. Warszawa: Ministerstwo Gospodarki, Departament Analiz i Prognoz, 2011. 153-154 p. <http://www.mg.gov.pl/files/upload/8436/RoG2011.pdf>, accessed November 20, 2011. ISSN 1429-3005.
- Rajan, R.G., Zingales L. *What do we know about capital structure? Some evidence from international data*. "Journal of Finance", vol. 50, 1995. 1421-1460 p. ISSN 1540-6261.
- Rutkowski, A. *Zarządzanie finansami*. Warszawa: Polskie Wydawnictwo Ekonomiczne, 2000, 241-243 p. ISBN 832081278X.
- Shapiro, A.C. *Modern Corporate Finance*. New York: Mcmillan Publishing Company, 1990. 484 p. ISBN 0024095303.
- Skowroński, A. *Kształtowanie struktury kapitału jako przedmiot decyzji finansowych* [in:] scientific editor: Sobiech, J. *Kapitałowa strategia przedsiębiorstwa*. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu, 2002. 59-73 p. ISBN 8388760971.
- Szczepankowski, P.J. *Zarządzanie finansami przedsiębiorstwa*. Warszawa: Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarządzania im. Leona Koźmińskiego, 2004. 92-95 p. ISBN 8389437171.
- Zygmunt, A., *Determinanty struktury kapitału przedsiębiorstw należących do branży przemysłu elektromaszynowego (w świetle badań empirycznych* [in:] Kopiński, A., *Finanse przedsiębiorstw*. Wrocław: Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu nr 98, 2010. 442-448 p. ISBN 978-83-7695-001-3.

14. Zygmunt, J. Polish companies financing in consideration of the pecking order theory [in:] scientific editor: Dutczak, M., The prospects of scientific and economic collaboration European Union and China in XXI century. Multi- aspect cooperation the European Union and China, Studia i Monografie. Z. 249, Opole: Oficyna Wydawnicza Politechniki Opolskiej, 2009. 147-152 p. ISBN 978-83-60691-64-9.

Primary Paper Section: A

Secondary Paper Section: AH

B PHYSICS AND MATHEMATICS

BA	GENERAL MATHEMATICS
BB	APPLIED STATISTICS, OPERATIONAL RESEARCH
BC	THEORY AND MANAGEMENT SYSTEMS
BD	INFORMATION THEORY
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BF	ELEMENTARY PARTICLE THEORY AND HIGH ENERGY PHYSICS
BG	NUCLEAR, ATOMIC AND MOLECULAR PHYSICS, ACCELERATORS
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BI	ACOUSTICS AND OSCILLATION
BJ	THERMODYNAMICS
BK	LIQUID MECHANICS
BL	PLASMA PHYSICS AND DISCHARGE THROUGH GASES
BM	SOLID-STATE PHYSICS AND MAGNETISM
BN	ASTRONOMY AND CELESTIAL MECHANICS, ASTROPHYSICS
BO	BIOPHYSICS

INFLUENCE OF RADIATIVE HEAT TRANSFER TO ROOM TEMPERATURE

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Abstract: The main idea of the room model development is to simulate thermal response of the building construction into changing boundary conditions. The room model was created and subsequently the thermal analysis was calculated. The central idea of this article is to study radiation influence to overall room temperature. Heat transfer by radiation can lead to two problems during simulation. Firstly, this phenomenon is strongly non-linear and secondly, precise emissivity value is uncertain. There is discussed an error due to neglecting radiation process for internal building conditions and also the possibility to model radiation by means of raising the value of heat transfer coefficient by convection. Temperature course of the simplified model is analyzed and compared to the original model output.

Keywords: heat transfer, radiation, building simulation, COMSOL Multiphysics.

Tab. 1: Nomenclature

Nomenclature			
T	Room temperature [K]	k	Thermal conductivity [$W \cdot m^{-1} \cdot K^{-1}$]
T_{inf}	Outer temperature [K]	c_p	Heat capacity [$J \cdot kg^{-1} \cdot K^{-1}$]
T_{amb}	Ambient temperature [K]	t	Time [s]
h	Convective heat transfer coefficient [$W \cdot m^{-2} \cdot K^{-1}$]	ε	Emissivity [-]
v	Speed [$m \cdot s^{-1}$]	σ	Stefan-Boltzmann constant [$kg \cdot s^{-3} \cdot K^{-4}$]
Q	Heat source [W]	ρ	Density [$kg \cdot m^{-3}$]
q	Heat flux [$W \cdot m^{-2}$]		

1 Introduction

Building constructions are structures with complicated bindings; internal temperature value is influenced by variation of outside conditions (external temperature, humidity, solar radiation etc.) as well as by temperature in ambient areas or by internal heat gains or sinks caused by device or occupancy. Important parameter of building construction is overall heat transfer coefficient, which determines the wall heat resistance.

Transient (non-stationary) heat transfer is formulated by second order Partial Differential Equation (PDE) therefore it is necessary to solve time and x, y, z derivation for calculating 3-dimensional temperature room distribution. Analytical solution of transient heat transfer is possible to count only for simple geometries thus complicated structures are solved only with significant simplifications. Therefore complex problems have to be solved numerically. Taking into account the facts mention before physical problems based on PDE are in these days calculated by the usage of computer power. A number of computer software mostly based on finite volume or finite element method can be used for numerical solution of Heat Transfer (HT) phenomenon. It is even possible to simulate these problems on personal computers (nowadays common 64-bit dual-core processors with several gigabytes of RAM) because of the increasing computer power.

Simple problems such as wall stationary temperature distribution or transient phenomenon in simple objects can be solved as 2-dimensional or even 1-dimensional tasks; contrariwise more complex problems have to be solved as 3-dimensional models. These complex models naturally need more computing power, memory and time because of the huge number of elements in

which the dependent variables have to be calculated. Problem complexity can be even larger, if it is important to couple more physics into one model such as heat and mass transfer. The number of elements can be reduced, if the specific problem is solved as symmetrical problem, but evidently this presumption is hardly fulfilled in strongly complex models.

The program used in this article for numerical calculating transient HT in buildings is COMSOL Multiphysics (formerly FEMLAB). The main program ability is based on numerical solving of PDE by finite element method. The software tool is used for HT calculation in this work however its usage is much wider as it can be seen in [1]. Nevertheless it was not used for building simulation too often. The usage of this program for similar problems can be found in [2, 3]. Program advantage is its ability to cooperate with MATLAB environment, which will be important for future control strategy development, examples of this linking are in [4].

In contrast to the paper [5], which was focused on model simplification due to HT by conduction from ambient rooms, is centre of this work HT by radiation. Heat transfer by radiation can caused simulation problems because of two main process characteristics. Firstly, this phenomenon is strongly non-linear and so it can bring instability of numerical solution. Secondly, precise emissivity value is uncertain, because it is variable with temperature and surface conditioning.

1.1 Experiment description

Used data were measured during the experiment since December 2010 till January 2011 in Zlín, Czech Republic. Experiment room area was (7.2x8.7x3) m and time period was nearly 19 days. Temperature was measured by globe and NiCr thermometers in modeled room area. External weather conditions were monitored by meteorological station placed on the roof at Faculty of Applied Informatics. The room was cyclically heated up and cooled down. Convector electric heaters were used as heat sources to control raising heat power precisely. There were used 2 electric heaters with heat power 2 and 3 kW respectively. Room temperature fluctuated during experiment period in range from 14 to 30°C.

The room is located on the top floor and it has one wall and roof influenced by external weather conditions. The rest of the room walls are affected by temperatures in internal areas which have their heat conditions very similar to the room temperature.

2 Mathematical model description

Heat transfer in modeled room is described by conduction and convection in walls and by conduction, convection and radiation in internal air. Fundamental equations which describe HT are presented in following chapters; more detail information about HT can be found in e.g. [6].

2.1 Domain settings

While conduction describes the heat passage through the wall and partially the HT in internal air, convection describes the HT in internal room air. Thus the major balance equation in domains is composed from 4 parts, where the first refers to HT by conduction, the second to convection process and the third part to heat accumulation in the mass of specific domain. The sum of these three processes is equal to domain heat source as you can see in following equation

$$\nabla(-k \cdot \nabla T) + \rho \cdot c_p \cdot v \cdot \nabla T + \rho \cdot c_p \cdot \frac{\partial T}{\partial t} = Q, \quad (1)$$

where k means heat conductivity, T room temperature, ρ density, c_p heat capacity, v speed, t time, Q heat source.

2.2 Boundary settings

There are used three types of boundary conditions. Firstly, Neumann boundary condition was calculated on external boundaries and boundaries related to internal air

$$q = h \cdot (T - T_{inf}), \tag{2}$$

where q means heat flux, h heat transfer coefficient, T boundary temperature and T_{inf} external temperature.

The values of Convective Heat Transfer Coefficient (CHTC) were set by CSN standard [7]. The value on the outer side of external walls was equal to $8 \text{ W.m}^{-2}.\text{K}^{-1}$ and it had value $2.5 \text{ W.m}^{-2}.\text{K}^{-1}$ on internal building walls, since it was calculated only with convection process.

On boundaries with internal air was active also second boundary equation, which describes HT by radiation

$$q = \varepsilon \cdot \sigma \cdot (T_{amb}^4 - T^4), \tag{3}$$

where ε means emissivity, σ Stefan- Boltzmann constant, T_{amb} ambient temperature, T boundary temperature.

Thirdly, it was used continuity boundary condition on the rest of boundaries e.g. internal boundaries between different wall domains.

3 Simulation

The model geometry was drawn in 3D construction design software CATIA and imported to the COMSOL Multiphysics environment. Equations for HT in solid domains were set by (1), however without the second equation term, in liquid domain (internal air) were used (1), on outer boundaries were used (2) and on inner boundaries were used (2) and (3).

3.1 Simulation properties

There was used free mesh with about 32 000 Degrees Of Freedom (DOF) and average simulation time on this machine was about 1200 s. Additionally, it was also studied coarser and finer meshes. There was a problem with creating coarser mesh than 16 000 DOF, because mesh creation crashed on narrow's regions, vice versa finer meshes had no problem with problem calculation, but it was not necessary use finer mesh by reason of minimal result differences. Clearly, demandingness of computing power increase significantly with complexity; hence we do not wish unnecessarily large number of DOF.

There was tested 2 solver tolerance. The first setting was with relative and absolute local error tolerance in the PDE solver of 10-3 and 10-4 respectively and the second solver setting was with even 10x smaller errors. The simulation results were almost identical, however simulation time were more than 3x longer with second setting. We use linear PARDISO solver, since it is supposed to profit most from the multithreading solver capability.

The model was calculated in COMSOL Multiphysics v3.5a on computer with 2 processor - Intel Xeon (2.33 GHz, 2x6 MB cache L2, quad-core) - with 4 GB RAM.

3.2 Simplified model verification

There is investigated overall radiation effect on room temperature for different HT setting. Heat transfer by radiation is ordinary described by eq. (3), but it is also possible to model this phenomenon due to enlarged value of CHTC – ordinary by $5.5 \text{ W.m}^{-2}.\text{K}^{-1}$.

Three variants of room model are compared with measured temperature course by wet bulb globe thermometer in Fig. 1.

Simulation results of updated model suffer from decreased HT by radiation which leads to higher temperature differences in experiment parts when room is heated up. Simulation outputs of newly proposed models are slightly more accurate in cooling phases but this difference is not as significant as its negative behaviour in heating phases.

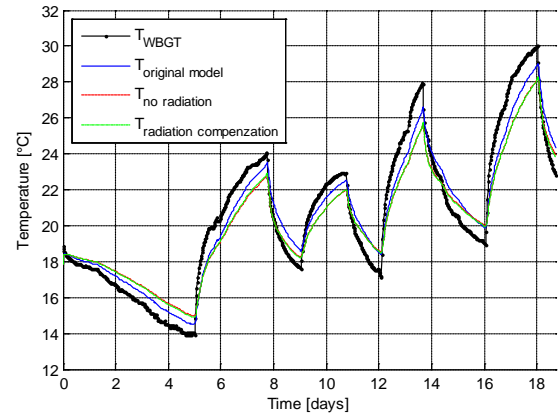


Fig. 1: Room temperature development

Time-developments of absolute and relative temperature differences are showed in Fig. 2. Absolute model differences fluctuate up to 2.72°C . Simplification of radiation process leads to increasing temperature error which is manifest in Fig. 2 a) where time-course of updated model errors is for the majority of the simulation time above original model error. The relative temperature errors of simplified models are compared with original model in Fig. 2 b). The most important facts resulting from this figure are consequently described in the table.

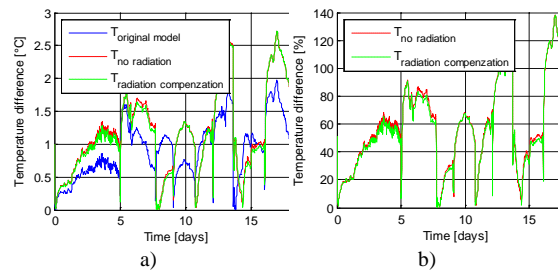


Fig. 2: Room temperature development

There are compared 3 variants of created model in Table 2. Firstly, there is original model which is based on HT by radiation by Eq. (3) and convection phenomenon with CHTC value equal to $2.5 \text{ W.m}^{-2}.\text{K}^{-1}$. Secondly, there is simplified model which neglect radiation process. Third model is also without radiation process, but in this case radiation is compensated by higher CHTC value. The CHTC parameter is in this model equal to $8 \text{ W.m}^{-2}.\text{K}^{-1}$.

There is calculated relative mean error of newly proposed models in comparison to original model. It is obvious that these simplifications lead to about 20% higher model error and only to minimal time savings about 5%.

Tab. 2: Comparison of different modelling methods of HT by radiation

Model types	Relative error [%]	Simulation time [s]
Original model	100	1180
Without radiation	123	1120
Higher value of CHTC	120	1122

Truncation of HT by radiation caused significant model error as well as its modelling by higher value of CHTC. Generally, it is

evident that proposed simplified models do not save simulation time.

4 Conclusion

There were proposed two variants of present-day model based on HT process to prevent numerical calculated errors as well as to save simulation time.

Simulation outputs indicate that the usage of similar simplifications lead to increasing modelling error about 20% and minimal decreasing of simulation time.

Simplified model presented in [7] was able to save significant measurement of resources in contrast to current simplifications. There is clearly seen from simulation results that current model should not be simplified in the sense of HT by radiation.

Literature:

1. Zimmerman, W. B J.: *Multiphysics Modelling with Finite Element Methods*. Ardésbir Guran. 1st edition. Singapore : World Scientific Publishing Co. Pte. Ltd., 2006. 422 s. ISBN 10 981-256-843-3
2. Schijndel, A. W. M. van; Schellen, H.L.; Wijffelaarr J.L.; Zundert, K. van.: *Application of an integrated indoor climate, HVAC and showcase*. 2008. Energy and Buildings. No. 40, 647–653.
3. Schellen, H.L.; Schijndel, A. W. M. van, Briggen; P. M.: *The use of COMSOL for Building Constructions Engineering regarding Heat and Moisture Transport*. In . Proceedings of the COMSOL Conference 2008 Hannover. [s.l.] : [s.n.], 2008.
4. Schijndel, J. van.: *Integrated Modeling using MatLab, Simulink and COMSOL: with heat, air and moisture applications for building physics and systems*. Saarbrucken : VDM Verlag Dr. Muller Aktiengesellschaft & Co. KG, 2008. 197 s. ISBN 978-3-639-10669-5.
5. Gerlich, V.; Prochazka, M.: *Influence on room temperature by heat transfer from surrounding areas*. Proceedings from international conference MMK 2010 : International Masaryk conference for PhD. Students and Young Researchers. Hradec Králové : [s.n.], 2010. s. 1380. ISBN 978-80-86703-41-1, ETTN 042-10-10003-11-4.
6. Lewis, R. W., Nithiarasu, P.; Seetharamu, K. N.; *Fundamentals of the Finite Element Method for Heat and Fluid Flow*. Chichester : John Wiley & Sons Ltd, 2004. 341 s. ISBN 0-470-84788-3.
7. Czech Bureau of Standards. *Thermal performance of buildings – Calculation of internal temperatures of a room in summer without mechanical cooling – Simplified methods*. 2005. Prague, (Aug).

Primary Paper Section: B

Secondary Paper Section: BJ

TESTING AND CALIBRATION OF SURVEYING INSTRUMENTS AND TOOLS – MEANS TO THE QUALITY INCREASE OF SURVEYING WORKS IN CONSTRUCTION

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Abstract: The paper introduces the basic calibration procedures of selected surveying instruments and ancillary equipment (digital levels and bar code levelling staffs, total stations and electronic tachometers, reflective systems). The results from testing of the light influence on work of digital level are presented. The testing procedure and results of the calibration of horizontal circles of the surveying instruments on the calibration device in the Slovak Institute of Metrology in Bratislava are introduced as well.

Key words: Calibration, testing, digital level, bar code levelling staff, electronic tachometer, horizontal circle.

1 Introduction

Currently, in addition to the conventional measurement systems – theodolites, electronic distance meters, total stations and GPS units, are levels the most frequently employed instruments in surveying practise. The optical levels are gradually replaced by digital automatic levels and conventional invar staffs by bar code levelling staffs. These new levels equipped by CCD sensor allows a full automation of staff reading and offers new benefits: higher accuracy of reading, automatic registration, elimination of the gross errors and mistakes, measured data are in electronic form with the possibility for further processing in different software environments.

2 Testing and calibration of levels and ancillary equipment

Among the most frequently occurring errors in levelling using digital levels belongs the staff graduation error [2, 9]. This error has a systematic character and significantly affects the accuracy of the results of precise levelling measurements (measurement in the National Levelling Network, measurement of the vertical displacement of building structures etc.). Calibration of the levelling staffs allows reducing the influence of the mentioned error to the minimum. The calibration measurement is possible to perform, e.g. using a linear laser interferometer. This method is suitable for levelling staffs with conventional graduation as well as for bar code levelling staffs. Calibration itself can be realized by various arrangement of calibration equipment, i.e. in the horizontal or vertical position of a levelling staff. In the following are given examples of some calibration equipments – comparators.

2.1 Comparator using laser interferometer at the Department of Theoretical Geodesy of FCE of SUT in Bratislava

Comparator using laser interferometer (CLI) with its accuracy and traceability to the National standard of length of the Slovak Republic at the Slovak Institute of Metrology (SIM) presents the highest item of metrological provision of the length at the Department of Theoretical Geodesy. From CLI are derived values of all onward comparators up to the parameters of the length baseline in Hlohovec. The CLI was calibrated at the SIM by measuring the differences in frequency of laser Δf to the National standard of length of the Slovak Republic (laser SIM B2) with extended relative uncertainty $U = 6,8 \cdot 10^{-11}$ ($P = 0,95$) [7].

CLI allows contactless calibration of all linear measures whose scale (lines) can be set up under setting microscope of the comparator. Using CLI can be calibrated the invar levelling

staffs of varying length, control invar measures and other working measures and standards. It is also possible to carry out verification (calibration) of the foldable levelling staffs (4 m), base staffs, measuring bands etc. [7].

2.2 Horizontal comparator for bar code levelling staffs

The basis of a laboratory is 30 m long calibration bench with two moving trucks (fig. 1), their distance from the reference point is measured by the laser interferometer HP5507B. Levelling staff, located on the moving trucks, is supported at Bessel's points. On the bench is mounted an electro-optical microscope, trucks with fixed levelling staff are moving under the microscope. This determines the position of all elements of the staff code.



Fig 1: Horizontal comparator

2.3 Vertical comparator for bar code levelling staff and system calibration

Vertical comparator (fig. 2) allows calibration of levelling staff in the vertical plane. The value of movements is measured by a laser interferometer, similar to the horizontal comparator. The vertical comparator can be used for calibration of levelling staffs in the vertical plane and for so called system calibration as well. The advantage of this procedure is that the levelling staff is during the calibration in the same position as in the field measurement.



Fig. 2: Vertical comparator

In general, it is assumed that the scale of measuring system is a scale of staff determined by calibration. Eventually, the properties of a level and levelling staff can vary and thus in order to control whole system is necessary to carry out a system calibration. At the system calibration are determined correct values of reading on the staff, from which is possible to determine scale of whole digital levelling system, stability of whole system in time and also is possible to estimate the accuracy of whole measuring system. Similar system is realized in Japan (Geographical Survey Institute) or in Slovenia (University of Ljubljana). Vertical comparator for calibration of levelling staffs in the vertical plane, allowing also system calibration, is in operation in the metrological laboratory of

Technical University in Graz (Austria). The Finish Geodetic Institute performs automatic calibration of levelling staffs by means of vertical comparator from 1996 and the system calibration from 2002. Similar calibration system is also in operation at Technical University in Ostrava.

2.4 Calibration system at the Department of Surveying of FCE of SUT in Bratislava

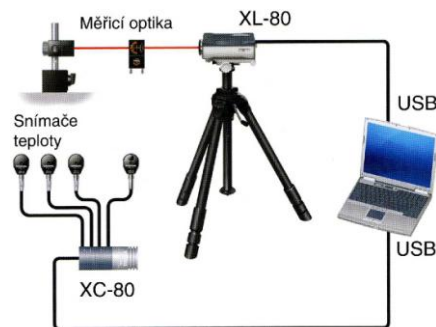
The preparing calibration system uses laser measuring system. The linear interferometer is based on frequency stabilized He-Ne laser of energetic class II (it can be used without special safety equipment). The laser head contains also an optoelectronic sensor of interference field and electronic network to process measured values (interpolation of the interference signal with resolution up to 1 nm, compensation of the length expansion of measured object). The interference system together with units for environment compensation and with electronic part of a system allows measuring of length with resolution up to 1 nm (dynamic measurement is also possible), angle measurement in range $\pm 10^\circ$ and measurement of differences of evenness. System can be used in order to calibrate invar and bar code levelling staffs, to test electronic distance meters, to observe movements of constructors etc.

The Department of Surveying of Faculty of Civil Engineering of SUT in Bratislava has currently at disposal laser measuring system XL 10 co. RENISHAW (fig. 3, 4), working with accuracy ($P = 95\%$) of linear measurement $0,5 \mu\text{m}$ per 1 m of measured length in entire range of defined measurement conditions – the air temperature 0 to 40°C and pressure 650 – 1150 hPa in measured path – with maximal range of linear measurements 80 m. System allows reading of values of the length with frequency 50 kHz at maximal speed of length change 4 m/s. Attained linear resolution 1 nm is well-preserved in whole range of the speed of measurement. The stability of frequency of the emitted laser wavelength is guaranteed by manufacturer $\pm 0,05 \cdot 10^{-9}$ per year and $\pm 0,02 \cdot 10^{-9}$ per hour. Laser XL 10 communicates with user's computer by means of USB port.



Fig 3: Laser head XL 10

Compensating unit XC 80 is one of the key components to ensure the stated accuracy of measurement with system XL. The compensating unit allows measuring of the air temperature, pressure and relative humidity in the path of ray and measuring of the temperature of measured object. Based on the acquired data can be adjusted the value of real laser wavelength, entering in real time into the processing of distance. In the same way can be compensated the influence of linear temperature expansion of measured object (in pursuance of before known coefficient of linear temperature expansion and measurement of average temperature of an object). Thereby are eliminated errors due to the changes of atmospheric conditions of environment. The time interval of reading is 7 s. Three sensors of material temperature and one sensor of atmospheric conditions (temperature, pressure, humidity) can be joined to the unit.



Obr.4: Measuring system XL 10 f. RENISHAW

3 Testing the influence of intensity of illumination on measurement with digital level

On the results of levelling measurements performed with digital levels affects in addition to conditions and impacts mentioned in the previous chapter, also the intensity of illumination. Requirements on the intensity of illumination are higher than for optical levels [2].

3.1 Light and photometric conditions

Light is an essential and unthinkable part of our life and environment and one of its fundamental factors. From a physical point of view as a part of electromagnetic waves constantly accompanies us, whether in the pure form of source of energy and light (sun radiation) or as an inherent part of the achievements of science and technology used in everyday life.

The intensity of light and illumination is a limiting factor for all areas of human activity, including surveying works. Modern surveying instruments used for terrestrial measurement needs to their operation not only the source of energy, but also particular photometric conditions in order to recognise the subject of measurement – target.

Recognition of measurement subject – target at the work with surveying instruments is in general given by the properties of observer, telescope and environment between the observer and target. When working with the conventional optical instruments, these properties can be specified in pursuance of [13]:

- photometric conditions (illumination, contrast),
- geometrical properties of a target (angular size, shape).

When using digital levels with automatic determination of elevation, it is necessary to point that size of the target is defined by a minimal section of graduation distance, which must be visible during the measurement.

Illumination E is derived photometric quantity determined as a ratio between uniformly distributed luminous flux $\Delta\Phi$, incident to the surface of the body, and area of this surface ΔS . The illumination unit is lux (lx). The area has one lux illumination if at each square meter area falls uniformly distributed luminous flux of one lux:

$$E = \frac{\Delta\Phi}{\Delta S} \quad (3.1)$$

For illustration are given some values of illumination under different conditions (tab. 1). For the experimental evaluation of illumination has been used portable luxmeter PU 150 with a measuring range up to 100 000 lx, equipped with two sensors: resistive – measuring range up to 40 lx, selenium – measuring range up to 100 000 lx [1].

Tab. 1

Place of measurement	Illumination (lx)
Moon illumination at full moon	0,15 up to 0,20

Illumination of street	2,00 up to 20
Illumination of a bedroom	up to 50
Illumination of a living room	up to 80
Illumination of an art room	up to 300
Room in the day-time	10 up to 10 000
Direct sun illumination	up to 100 000

3.2 Conclusions from experimental measurements of photometric conditions using digital level DiNi12

- measuring time under normal daily illumination (200 – 3000) lx and more corresponds with manufacturer data and ranges up to 4 s,
- when decreasing the intensity of illumination under 80 lx, the measuring time is increasing up to twice (6 s and more),
- the threshold value at uniformly artificial illumination (when instrument yet measures) is (8 to 5) lx, (at spotlighting are necessary values minimal 10 lx and higher),
- illumination of staff graduation by direct sun light of higher intensity (no diffuse illumination) is indicated by interruption of measurement – „unreadable staff”,
- under daily illumination is the most suitable oblique (dispersive) light (200 – 400) lx (variance of repeated readings to $\pm 0,1$ mm),
- increasing intensity of illumination, direct sun illumination and increasing distance of sights makes worse results (variance of repeated readings to 0,6 mm) and prolongs the time of measurement,
- measurement with digital level DiNi 12 is possible on the ground and in low light conditions, but it is necessary to take into account that under reduced intensity of illumination below (120 – 100) lx decreases accuracy of measurement results.

4 Calibration of electronic distance meters on the length comparative baseline in the field

Exploitation of electronic distance meters (EDM) in surveying practice, their rapid development in terms of construction, especially to range and accuracy of measured distance, brings a solution of new tasks in the area of measurement processing. One of the main characteristics is accuracy parameters of EDM. Low variance of the measurements when using EDM can often lead to a deep trust in the measurement results and factor of change of EDM parameters is often neglected. To the fore appears the reproducibility of distances when repeating measurement at different time intervals [10].

Manufacturer specifies the accuracy for particular types of instruments by means of standard deviation of the measured distance in the following form:

$$\sigma_d = a + b \cdot 10^{-6} \quad (4.1)$$

where a represents additive member and b is scale member.

These parameters stated by the manufacturer are usually obtained from the processing of multiple measurements in laboratory conditions. During the long-term exploitation is necessary to verify stated parameters in the field conditions. EDM user role is therefore check the reliability and accuracy of EDM before its exploitation, what should become the norm when using all instruments in surveying practice. One of the possibilities of verification of the EDM parameters is hence its calibration on the field length baseline. Such length comparative baseline – baseline Hlohovec, was built by the Department of

Theoretical Geodesy of Faculty of Civil Engineering in collaboration with then IGHP n.p. Žilina, plant Bratislava in 1978 [10].

4.1 Calibration methodology on the baseline Hlohovec

The calibration procedure on the baseline in Hlohovec (fig. 5) consists of two steps [7, 10]:

- realization of the measurement and acquisition of measured data,
- processing of measured data.

For the calibration measurement are used 5 pillars with necessary centring ($n=5$), labelled Z1 – Z5. This configuration allows to measure

$$n \cdot (n - 1) / 2 \quad (4.2)$$

combinations, in this case 10 distances used for calibration of the EDM. Full calibration measurement is recommended to be carried out in two series over two days [10], best under different atmospheric conditions.

A series of measurement presents reciprocal distance measurement in all combination. The minimal calibration measurement, which is sufficient for most instruments in surveying practice, consists of one measurement in one series.



Fig. 5: Total station on the baseline in Hlohovec

4.2 Processing of measured data

Result from the processing of calibration measurements is determination of the values of selected instrument parameters, determination of the confidence interval of these parameters and testing of hypotheses about the selected parameters. Processing procedure starts with the determination of physical reductions (influence of the air temperature, pressure and humidity), the application of mathematical corrections (transfer of the slope distance to the reference plane), further includes correction from direction (misalignment of the baseline points from its axis) and corrections from elevation. Another part of the procedure represents an estimate of the additive constant and estimate of the parameters of the regression line, representing correction of EDM, proportional to the measured distance [10].

Additive constant of EDM can be defined follows

$$c = k + c_1 + c_2 \quad (4.3)$$

where

k is a part of the additive constant, caused by the electronic part of the instrument. This part affects the accuracy of the measurement result. Determination of k is possible only in laboratory conditions.

c_1 is geometrical part of the additive constant,

c_2 is geometrical part of the additive constant of reflective system.

The value $c_1 + c_2$ have at most of EDM for manufacturer recommended reflective system zero size. In the case of different reflective system is needed to determine the value of additive constant, because its unknown size acts in the measurement as a systematic error. Therefore, the additive constant is estimated on

basis of the second linear model (indirect measurement of vector parameter) from the measurement on the baseline [10].

According to the mentioned model are obtained estimates of the measured distances, estimates of the additive constant together with the characteristics of accuracy of instrument. Estimates of the additive constant pays for calibrated system: EDM – reflective system. Estimates of the distances, characterised by their covariance matrix, are corrected about the additive constant and can be directly compare with parameters of the baseline. By means of linear regression, considering statistical properties of estimates, are then determined search parameters of EDM:

a (additive constant) and b (scale constant – proportional to the measured distance) – equation 4.1.

Geodetic baseline Hlohovec allows to determine the real value of the additive constant of system: EDM – reflective system and to assess the accuracy of the distance measurement with particular system. Determination of the correct value of the measured value is necessary conditions from a view of the assurance of metrological traceability – realization of the meter as the unit of distance [10].

5 Calibration of horizontal circles of optical and electronic theodolites

In the past, to assess the quality of horizontal circles, respectively accuracy of the measurement of angles was used procedure based on the standard STN ISO 8322. This standard assumes measurement in two faces of the telescope, in four ranks and in two series. Accuracy of the measurement of angles or directions is according to this standard specified by standard error „ m_a “ [7, 8].

Currently, the process of quality assessment of optical and electronic theodolites, EDM and electronic tacheometers is defined in the following standards [5]:

STN ISO 17123-3: 2001 Optics and optical instruments – Field procedures for testing geodetic and surveying instruments. Part 3: Theodolites.

STN ISO 17123-4: 2001 Optics and optical instruments – Field procedures for testing geodetic and surveying instruments. Part 4: Electro-optical distance meters.

STN ISO 17123-5: 2005 Optics and optical instruments – Field procedures for testing geodetic and surveying instruments. Part 5: Electronic tacheometers.

Calibration of horizontal circles of optical and electronic theodolites can be carried out under laboratory conditions, e.g. on an automated device for calibration of optical polygons EZB-3 in the Slovak Institute of Metrology in Bratislava (SIM). This standard device is part of the primary standard and hereby the national standard of plane angle in the Slovak Republic. The basis of this device is 72 edged optical polygon representing design of directions in range (0 to 360)° with 5° increment and extended uncertainty of transmission to calibrated instrument to 0,1" ($P = 95\%$), depending on the metrological parameters of calibrated instrument. This device has been used for calibration of many optical and electronic theodolites, details in [3, 4, 8, 11, 12]. The result of such calibration is a set of horizontal scale corrective values for particular nominal values of the scale, determined from several series of measurement, eventually also the parameters of approximating function.

An important part of processing is the statistical testing of parameters of normal distribution and analysis of variance. Detailed information about the testing of normal distribution and ANOVA (ANalysis Of Variance) is given in the literature [3, 6, 8]. As an example is given results from calibration of electronic theodolite Leica TC 800. Graphical representation of measured data – the corrections to particular places on the horizontal circle is in fig. 6.

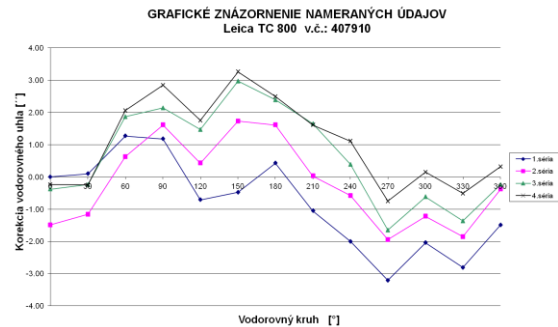


Fig. 6: Values of corrections for four series of measurement from calibration device in SIM

In the approximation of the measured values was applied cyclic function (sinusoid) (fig. 7), which is based on the relationship:

$$y = b_0 + b \cdot \sin(t + B), \quad (5.1)$$

where
$$t = \frac{2 \cdot \pi}{P} \cdot x = \frac{2 \cdot \pi}{360^\circ} \cdot x,$$

x is the rotation of horizontal circle,
 b_0 is the coordinate where axis of sinusoid intersects the y-axis,
 b is the amplitude of the sinusoid,
 B is the shift of the origin of the sinusoid.

Equation (5.1) can be written following:

$$y = b_0 + b \cdot \sin(t) \cdot \cos(B) + b \cdot \cos(t) \cdot \sin(B) \quad (5.2)$$

After substitution:

$$b_1 = b \cdot \cos(B) \text{ and } b_2 = b \cdot \sin(B)$$

equation (5.2) can be written as follows:

$$y = b_0 + b_1 \cdot \sin(t) + b_2 \cdot \cos(t) \quad (5.3)$$

The coefficients b_0 , b_1 , b_2 can be estimated using the least squares method and their values are listed in the chart. From these coefficients may re-determine the parameters of equation (5.1):

$$\tan(B) = \frac{b_1}{b_2}, b = \sqrt{b_1^2 + b_2^2} \quad (5.5)$$

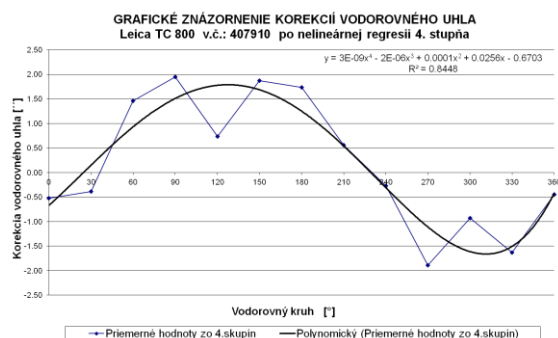


Fig. 7: Calibration curve and approximating cyclic function

Literature:

1. HALAHYJA et al.: *Construction Thermal Technique, Acoustics and Illumination*. Alfa, Bratislava – SNTL, Prague, 1985.

2. HÁNEK, P.: *Testing of Electronic Surveying Instruments*. In.: Proceedings of 8th Mining Surveying Conference „Actual Problems of Mining Surveying and Geology“. VŠB-TU Ostrava, Faculty of Mining and Geology, Ostrava 2001, pp. 73-82.
3. HAŠKOVÁ, V.: *Calibration of Horizontal Circles of Theodolites*. In.: History, Present and Future of Surveying Teaching in the Field. Proceedings of the Seminar on the 50th Anniversary of Teaching on Počúvadlo. Bratislava, KGDE FCE SUT, 2007, ISBN 978-80-227-2727-3, pp. 67-72.
4. HAŠKOVÁ, V., SOKOL, Š., JEŽKO, J., MOKROŠ, J.: *Calibration of Horizontal Circles of Surveying Instruments*. In.: International Society for Mine Surveying. XIII International Congress, 24-28 September 2007, Budapest, Hungary, Paper Nr. 62.
5. JEŽKO, J.: *New Standards for Testing Surveying Instruments in Practice*. Slovak Surveyor and Cartographer. 1/2010. Chamber of Surveyors and Cartographers. Bratislava, 2010, ISSN 1335-4019, pp. 5-9.
6. JEŽKO, J., HAŠKOVÁ, V., BAJTALA, M.: *Some Knowledge from Calibration of Horizontal Circles of Surveying Instruments*. In: Proceedings on CD „XII. Conference and VI. Congress SDMG“ Society of Mining Surveyors and Geologists – VŠB Technical University of Ostrava, Hustopeče 2005.
7. JEŽKO, J., BAJTALA, M.: *Calibration of Surveying Instruments*. Acta Montanistica Slovaca – periodical magazine. Košice, 2/2005, vol. 10, ISSN 1355-1788, pp.112-118.
8. JEŽKO, J., MOKROŠ, J., TAJZLER, I.: *Calibration of Horizontal Circles of Theodolites*. Geodetic and Cartographic Scope, 50/92, 2004, no. 2, pp. 25 - 29.
9. MELICHER, J.: *Effect of Changes in Focal Length on Determination of Some Parameters of Surveying Instruments*. In.: Proceedings „Metrology in Geodesy“. Department of Theoretical Surveying FCE SUT Bratislava 2001, pp. 115-122.
10. MIČUDA, J., KORČÁK, P.: *Methodology for Calibration of Electronic Distance Meters on the Length Baseline Hlohovec*. In.: Proceedings „Metrology in Geodesy“. Department of Theoretical Surveying FCE SUT Bratislava 2001, pp. 101-105.
11. MOKROŠ J.: *Fundamentals of Metrology of Plane Angle*. Purpose-built publication SIM, Bratislava, June 2006, 57 p.
12. MOKROŠ J.: *Current Options for Calibration of the Standards and Measures of Plane Angles and Selected Deviation in the Shape in SIM*. Metrology and Testing, 10, June 2005, no. 2, pp. 16-19.
13. SOKOL, Š., MICHALČÁK, S.: *Surveying. Angle Measurement*. Publishing SUT, Bratislava, 1999, 245 p.

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Secondary Paper Section: BB

I INFORMATICS

IN INFORMATICS

HYBRID NEURAL NETWORKS AS A NEW APPROACH IN TIME SERIES FORECASTING

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Abstract: Nowadays there exists a various number of ways for time series prediction. Econometric analysis includes mainly ARIMA and GARCH models. However, in recent years, as computers become more and more the part of our lives, methods of machine learning have been used; among them artificial neural networks. This work combines these two independent and different prediction models into one combined model for time series prediction as it is an assumption that the combination could achieve better prediction results than the individual models. This new approach is then applied to exchange rates data to illustrate the sense of using this hybrid modelling technique.

Keywords: time series, ARIMA, neural networks, RBF, hybrid modeling, AUD/USD.

1 Introduction

The predictions play very important role in various areas of people's lives – demographic predictions, industrial planning, geographical expectations, water consumptions and so on. Also, financial analyzers try to predict the future value of commodities, stocks or exchange rates. Resulting from this, nowadays, more than ever, making precise predictions is a must. To achieve these kind of predictions, various approaches are applied. The most used approach, which has been used for many years, is a statistical approach. This approach is represented by ARIMA, GARCH, Exponential Smoothing, Kalman filter, linear regression and so on. However, it has been showed that this technique does not always provide sufficient results. It can be caused by a complexity of real problems or because of any other reason.

Therefore, other methods, using mainly the power of computers, have been created. Among these methods of machine learning, artificial neural networks, inspiring by a human neural network, have become very popular. Today, these ANN models have become the interest of many prediction analyzers.

The idea of better predictions results from making some combination of these two model in order to achieve very accurate future values of any variable. This idea is not at all new. The hybrid models have been created and then applied and used in many areas. The purpose is to combine some good qualities from individual models to better the results in whatever subject. As for time series predictions, researchers have proposed (among others) to hybridize ARIMA models together with ANN models to create one hybrid models presuming to have better predictive results. This presumption will therefore be tested in this work in order to find out whether it is worth making this type of models. The hybrid model will be tested on economic time series, more specifically on exchange rate of AUD/USD. Tested data include 1044 observations, from 03/01/2007 to 03/01/2011.

What for other section of this work; in section 2, the ARIMA statistical models, which will be used to create hybrid model, will be discussed. Section 3 will deal with artificial neural networks. Section 4 will talk something more about hybrid models. In section 5, the particular tested hybrid model will be presented and its forecast results will be compared to individual models. Section 6 concludes this work.

2 ARIMA Models

ARMA models, also known as Box-Jenkins models are an excellent tool in statistical time series modelling if the current value of variable linearly depends on the previous values of the same variable or if the current value of random part depends on the previous values of random part. Formally, ARMA model can be expressed as

$$y_t = \sum_{i=1}^p \phi_i y_{t-i} + \sum_{j=0}^q \theta_j \varepsilon_{t-j} \quad (1)$$

This model is composed of two parts. The first, autoregressive part, represented by autoregressive parameters (ϕ_1, ϕ_2, \dots) is deterministic; and the second part, also known as the moving average part represented by independent random parts $(\varepsilon_t, \varepsilon_{t-1}, \varepsilon_{t-2}, \dots)$ is stochastic. The number of p determines AR order, the number of q determines MA order in ARMA(p,q) model.

In order one can model time series using ARIMA models, the time series has to be stationary, or at least is has to be weak-stationary. It means the time series has to be statistically unchangeable in its expected value and variance (first and second moment). But in real world, there exists a huge number of problems where the observing time series is not stationary in. Therefore ARIMA models, as an extension to ARMA models, can be applied. Let y_t be a time series. y_t will be called ARIMA(p,d,q) process if its d^{th} differences produce ARMA(p,q) process. ARIMA can be formally defined as

$$\Phi(B)(1-B)^d y_t = \mu + \Theta(B)\varepsilon_t \quad (2)$$

It is also obvious that if d equals zero, ARIMA equals just simple ARMA process.

Another option, except of using ARIMA models, how transform non-stationary time series into stationary includes (if possible) for example detrending or logarithmic calculation.

Process of making a statistical model have more steps. The first step, after data collection and analysis, is identification of model. Identification is usually done using graphical representations of autocorrelation and partial autocorrelation functions, known as ACF and PACF. There should be at least $K \leq N/4$ values in the ACF and PACF graph. $\pm 2/\sqrt{N}$ is a border between statistically significant and non-significant value in the graph. The table 1 introduces the basic rules for model identification.

	ACF	PACF
MA(q)	Cut off after lag q	Exponential or sinusoid decline
AR(p)	Exponential or sinusoid decline	Cut off after lag p
ARMA(p,q)	Exponential or sinusoid decline	Exponential or sinusoid decline

Table 1 Theoretical ACF and PACF of Box-Jenkins models

Apart from ACF and PACF, model identification can be also performed via other tools, for example various information criterions (AIC, SIC, BIC).

After model identification, quantification of model using a statistical computer program (R, Eviews, Matlab, SPSS) is performed. Diagnosis of model (and its residuals) is then performed in order to find out whether our model correctly model the specified time series. If the model is not correct, it had to be repaired or another part has to be incorporated into the model (f. ex. GARCH). If so, quantified model is evaluated and then predictions are made. The evaluation characteristics for quantified model as well as future prediction include among others MSE (Mean Square Error), RMSE (Root of MSE) or MAPE (Mean Absolute Percentage Error).

$$MSE = \frac{1}{N} \sum_{t=1}^N (y_t - \hat{y}_t)^2 = \frac{1}{N} \sum_{t=1}^N e_t^2 \quad (3)$$

$$MAPE = \frac{1}{N} \sum_{t=1}^N \frac{|y_t - \hat{y}_t|}{y_t} \cdot 100 = \frac{1}{N} \sum_{t=1}^N \frac{|e_t|}{y_t} \cdot 100 \quad (4)$$

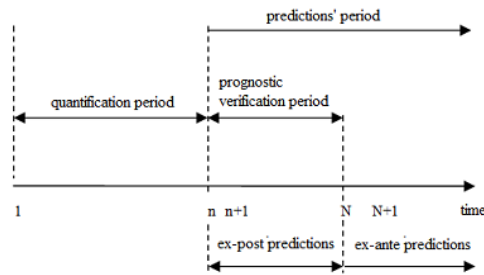


Figure 1 Time axis division in time series modelling

3 Artificial Neural Networks

As having said before, artificial neural networks representing a part of machine learning techniques can be used to making valuable time series predictions. Since appropriate to have some feedback for network learning in this case, supervised ANNs will be discussed. The goal of ANN is to find an input-output function so that the output would have desired parameters and a predicted error would be minimal.

Let $F: x_t \in R^k \rightarrow y_t \in R^1$ be a projection assigning k-dimensional vector of inputs $x_t^T = (x_{1t}, x_{2t}, \dots, x_{kt})$ one dimensional output y_t in specific time moment t. Let $G: G(x_t, w_t): x_t \in R_{train}^k \rightarrow y_t \in R_{train}^1$ be a restriction of F. The task is then to find the values of w_t so that functional values of G would be so close to desired output as it is possible. Let E(w) be a function

$$E(w_t) = \sum_{x_t, y_t \in R_{train}^k} (G(x_t, w_t) - y_t) \tag{5}$$

This function will represent squares of deviations of function G from expecting values of function F. If a minimum is found, G is adapted for approximation of F.

The simplest model of the mathematical model of neuron discussed above is perceptron. It is a feed-forward type of network, so it contains only forward relations realised only from lower layers to higher. Architecture of feed-forward neural network can be seen on figure 2.

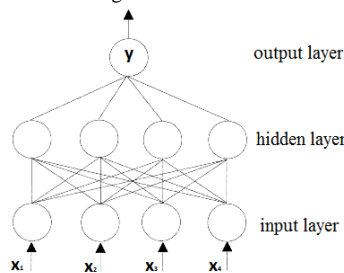


Figure 2 Feed-forward Artificial Neural Network with 4 Inputs and 1 Output

As seen in the figure 2, input set is represented by the vector $x_t^T = (x_{1t}, x_{2t}, \dots, x_{nt})$ and output layer containing usually only one neuron is represented by the network output. In most cases there is also hidden layer containing hidden neurons. Using $G(x_t, w_t)$, the inputs are transformed into output when going through the network. The produced output is then compared to the historical output of a series.

Learning or so called training of the network means adaption of weights between inputs and hidden neurons and between hidden neurons and the output. The aim of learning is to have a trained network so that G would approach F the most. Then one can say that ANN became an expert in specific area of data which had been trained on. Learning is performed on training set data (see fig 1).

The learning of feed forwards ANNs (perceptron, RBF) is based on back propagation algorithm. ANN counts its output on the base of its inputs by counting potentials and then outputs (activated potentials) of hidden neurons and an error of the whole network for specific input is counted. Afterwards an error is back propagated into the network and the weights are adapted on the base of this error. This iterative procedure is performed (for every input of training set) while the network is considered to be adapted. It is the moment when error function achieves a minimum.

Once the networks has been trained, the network is then validated. Validation is performed on validation set (see fig 1) and consists in making ex-post predictions. The evaluation of ex-post predictions, as well as networks training and ex-ante predictions, is usually checked by characteristics like RMSE or MSE. When ex-post predictions evaluation is made, we can proceed to make ex-ante predictions by this ANN.

Due to some cons of perceptron network, the more sophisticated version of feed forward neural network has been created. This network is called RBF and the architecture is quite similar to perceptron, however there are some differences. RBF has its name due to radial basic activation functions (RBF) in activation of hidden neurons which is different from sigma function of perceptron. In addition, calculation of potentials of hidden neurons is calculated as Euclidean distance given by vectors $u^j = \|x - w^j\|^2$ and not by just scalar product of X and W as at perceptron. Thanks to these modifications, RBF provides much better predictions results as perceptron.

4 Hybrid Neural Networks

Generally, hybrid model is any combination of two or more independent models. These models are integrated into one complex producing only one output in specific time t. The purpose of this operation is to raise the prediction accuracy of the model.

Nowadays, there exists several types of hybrid models, such as fuzzy networks plus ANN, ARIMA plus ANN or ANNs with other specialized systems. As mentioned in section 1, this work will deal with ARIMA plus ANN hybrid models.

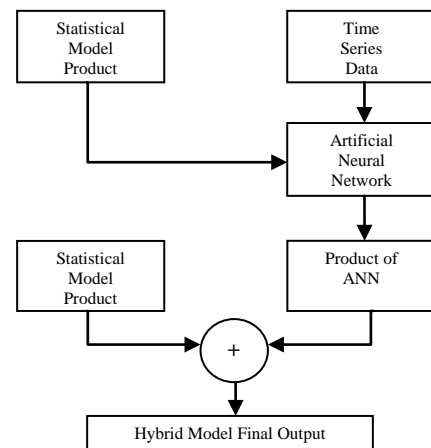


Figure 3 General ARIMA plus ANN hybrid model schema

As the reason for constructing hybrid model is to have better forecasts, the main point here is to find out how to combine independent models in order to produce the best possible results. This is done by correctly constructed hybrid schemas. Figure 3 illustrates basic ARIMA plus ANN hybrid model.

Seeing on figure 3, the inputs of ANN are not only time series data (just like at classical ANN) but also a product of constructed statistical model enters this ANN. This product of statistical

model can include residuals, outputs estimations or predictions. This ANN then produces the output on which a linear technique could also be applied to produce final combined hybrid model output (however it is not necessary).

Since this is relatively new and experimental approach in time series modeling, very dependent on chosen hybrid model schema, it is no surprise that the increase of predictions is possible, however not guaranteed. Also for that reason, it is good to perform comparison with classical modelling approaches.

5 Tested Hybrid Model and Forecasting Results

Theoretical aspects of hybrid modelling described above will be applied to real time series data. Data used to illustrate the sense of using ARIMA plus ANN hybrid model were exchange rates of AUD/USD. These are daily data taken from 03/01/2007 to 03/01/2011. The number of data is 1044 and the data were downloaded from the following site: <http://www.global-view.com/forex-trading-tools/forex-history>.

Because of test reasons, the observed data were divided into two parts – the training set contained 1002 values (03/01/2007 – 12/31/2010) and the validation set (for model verification) contained 42 observed values (01/01/2011– 03/01/2011). The ANN modeling was performed by self-constructed application and econometric models were quantified in Eviews.

For hybrid model testing, the following hybrid schema illustrated on figure 4 was chosen.

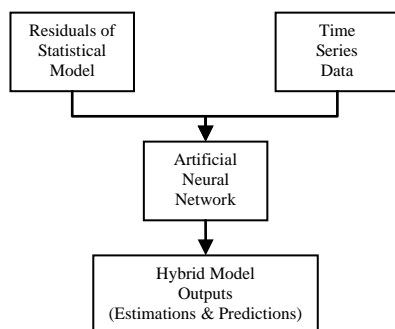


Figure 4 Schema of Tested Hybrid Model

The assumption was that this network could better the predictions' results of individuals models. For network testing, RMSE evaluative characteristics were used. Except for perceptron and classical RBF network, the extensions of RBF (soft RBF, cloud RBF, granular RBF) which have tendency of better estimations. For details of these RBF extensions, see [3].

Modelling time series using ANN application demands performing plenty of experiments (and of course a lot of time) since ANN contains huge number of parameters (speed of learning, number of hidden neurons, input neurons, number of epochs, size of training set, size of validation set,...) to set up. Finally, the best results which were achieved are in the following table 2.

	Hybrid model (perceptron)	Hybrid model (RBF)
Type of ANN		Cloud RBF
Number of hidden neurons	5	8
Speed of Learning	0,10	0,10
Number of epochs	2000	2000
Training set (A)	1001	1001
Validation set (E)	42	42
RMSE _A	0,0001110	0,0074812
RMSE _E	0,0055365	0,0032273

Table 2 Best Achieved Approximate and Predictive Results evaluated by RMSE

To show the effectiveness or ineffectiveness of this constructed hybrid model, comparative analysis with individual model were performed.

What for econometric model, AUD/USD seemed to be AR(0) process with only a constant. However, it later showed that residuals did not create a white noise process and there are some dependencies in residuals. Therefore the model had to be repaired. And as exchange rates are high frequented data, they are very dynamic and a volatility is changing and is not constant over time, there was an presumption of ARCH effect. Because of this, (G)ARCH models were implemented in the model. In this specific case, the extension of classical (G)ARCH – TGARCH provided the best results. After that, diagnosis of the model was performed again and the model was confirmed to be OK. The residuals from this model were than the inputs into the ANN network. For (G)ARCH models details can be found in [1] [5].

The numerical comparison of all tested and quantified models are shown in table 3. The models are ordered according to root mean squared error achieved for new data (ex-post predictions) from validation set. Training and validation set was always set to 1001/42 and number of epochs was set to 2000 for every model.

	Type of Model	Hidden Neurons	RMSE _E	RMSE _A
1.	Hybrid (Cloud RBF)	8	0,003227	0,007481
2.	Granular RBF	7	0,005316	0,031223
3.	Hybrid (Perceptron)	5	0,005536	0,000111
4.	AR(0) + TGARCH(1,1,1)	--	0,006205	0,009300
5.	RBF	12	0,009063	0,023915
6.	Perceptron	4	0,046615	0,009573

Table 3 Approximate and Predictive Accuracy of Various Types of Models of AUD/USD (Measured by RMSE)

As we can see from table 3, the assumption that RBF network provides better results than perceptron network has been confirmed too. In addition, extensions of RBF (cloud, granular RBF) also provided better results than classical RBF network.

6 Conclusion

The aim of this paper was to apply a new approach in time series modelling – hybrid models. After theoretical aspects of ARIMA models, ANNs and hybrid models, one specific hybrid model scheme was constructed. After the construction, the model was thoroughly tested to find out whether it is worth building hybrid models.

The tested hybrid model proved excellent results and its numerical characteristics overcame individual models (ANN, statistical models) in this case. Actually, according to RMSE_E errors, it was the best model of all tested models. What is also very surprising is the fact that also perceptron overcame a statistical model. The tested hybrid model provided the best results with cloud RBF network.

However, even if hybrid modelling can cause an improvement of statistical or neural network model, it is certainly not an always-rule. One of the most significant factors on the improvement or unimprovement of the prediction results is hybrid model schema which is used.

A slight disadvantage of hybrid approach in time series modelling is a fact that one has to have products of ANN and products of statistical model as well. So it is necessary to create two independent models (one statistical model and one ANN model with data inputs and statistical product inputs as well). It is therefore obvious that hybrid approach demands more time for

time series modelling than an individual approach. In addition to this, this hybridization does not have to lead to better predictions. However, in today's world full of complex problems with linear and non-linear relations, hybrid model can be more effective solution to specific problem than individual models and because of this hybrid modelling has definitely the sense and it is certainly worth trying modelling real problems in this way.

Literature:

1. ENGLE, R.F.: *Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation*, *Econometrica*, Vol. 50, No. 4, 1982. p987 – p1008.
2. LEK, S., GUÉGAN, J.F.: *Artificial neural networks as a tool in ecological modeling*, *Ecological Modelling* 120, 1999. p65–p73.
3. MARČEK, D., MARČEK, M.: *Neurónové siete a ich aplikácie*, Žilina: EDIS – Vydavateľstvo ŽU, 2006. 223p. ISBN 80-8070-497-X.
4. MARČEK, D.: *Some Intelligent Approaches to Stock Price Modelling and Forecasting*, *Journal of Information, Control and Management Systems*, Vol. 2, 2004.
5. MARČEK, M.: *Viacnásobná štatistická analýza dát a modely časových radov v ekonómii*, Opava: Silesian University, 2009. 242p. ISBN 978-80-7248-513-0.
6. MONTGOMMERY, D.C., JENNINGS, C.L., KULAHCI, M.: *Introduction to Time Series Analysis and Forecasting*, New Jersey: John Wiley & Sons, Inc, 2008. 445p. ISBN 978-0-471-65397-4.
7. ZHANG, G., PATUWO, B.E., HU, M.Y.: *Forecasting with Artificial Neural Networks: The State of Art*, *International Journal of Forecasting* 14, 1998. p35-p62.

Primary Paper Section: I**Secondary Paper Section: IN**

IDENTIFICATION OF THE EXPERIMENTAL ULTRASONIC SYSTEM PARAMETERS

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Abstract: Successful navigation of the mobile robot in the environment is impossible without appropriate sensory system. Various mobile robotic systems often use the ultrasonic range finders to sense a working space. The contribution deals with the ultrasonic sensors identification procedure. Novel methodology for determination of the sonar radiation cone width is presented. This procedure allows to specify the parameters of the sonar radiation cone. The identification of the experimental ultrasonic system reveals some new properties of the sonar radiation cone. The ascertained facts allows the mobile robot to move in the environment more safely.

Keywords: ultrasonic range finder, identification of the sonar radiation cone.

1 Introduction

The main goal of recent research in the field of mobile robotics is autonomous performance of mobile robots. Autonomous operation of mobile robots is strongly dependent on the sensor system which often comprises of ultrasonic range finders. Ultrasonic range finders (sonars) are characterized by a number of advantageous features such as ease of use, relatively low cost, safe operation, and thus they are employed in various fields of science and industry for non-contact distance measuring. In mobile robotics, they are used to measure relative distances to the obstacles in the robot neighbourhood to ensure collision-free motion and navigation in the environment. Despite all the advances, the application of ultrasonic sensors is accompanied by a variety of problems such as multiple reflections or extensive wide angle of the ultrasonic beam.

The acquired range readings can be utilised by many ways. One of them is the creation of the environment representation, which is in principle a map of the environment. The occupancy grid is a popular form of the representation of the robot's workspace [3], [5], [7]. Occupancy grids are usually used to express the spatial arrangement of the environment as its two-dimensional projection to the plane of the robot motion. Each cell of the grid represents definite area of space and known information about it. An example of the robotic navigational map in the form of occupancy grid is depicted in Fig. 1.

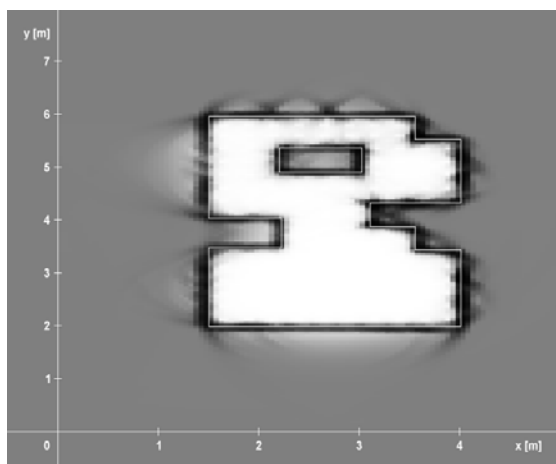


Fig. 1. An example of robot map constructed from ultrasonic measurements.

Main problem in map building algorithms is varied uncertainty of measured sonar data. There are several methods of handling

data uncertainty and occupancy grid calculation known [4], [8]. The use of an appropriate and adjusted sensory model is a successful approach to minimize the amount of uncertainty in processing of measured data to a robot navigational map. Such sensory model can be constructed on the basis of the data obtained by identification of essential sonar parameters.

2 Ultrasonic sensor

The problems of sonar usage rise from the physical nature of the operating principle of these systems and resulting data from the sensing process is loaded with a variety of uncertainties. The ultrasonic range finders work according to a simple principle: a packet of ultrasonic waves is generated and the resulting echo is detected. The time elapsed between transmission and reception is assumed to be proportional to the distance of the sensed obstacle. In the air the ultrasonic signal propagates to the space in a beam of the conical form [2].

There are basically three main sources of measurement uncertainty in the process of determination of presence of an object and its relative distance with the ultrasonic sensors. First, the measured distance r is affected by an error. The error of measurement is at level of few percent of the measured distance over the entire range. This uncertainty is caused by the characteristics of air such as its temperature, humidity, turbulence and pressure.

The second uncertainty is a phenomenon of multiple reflections, which may occur in the case that the incidence angle of signal to the obstacle is larger than a so-called *critical angle* which is strongly dependent on the surface characteristics. In this case the reflection of the signal is mainly specular and the sensor may receive the ultrasonic beam after multiple reflections, which is called a *long reading*, or it may even disappear. Therefore, in order to return a significant range reading, the angle of incidence on the object surface has to be smaller than the critical angle.

The third source of uncertainty results from the propagation of the ultrasonic signal to the space in the form of a cone with an apex in the centre of the sensor active element and an axis in the scanning direction. The angle of radiation cone can be in fact fairly wide. So the exact angular position of the object reflecting the echo might not be determined. An example of such situation is depicted in the Fig. 2.

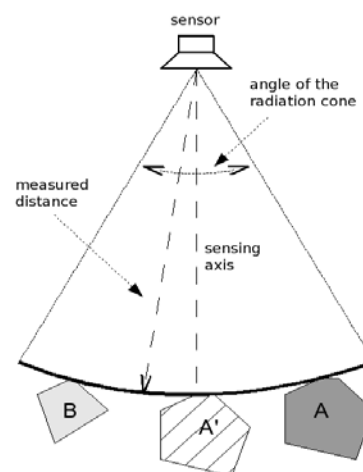


Fig. 2. Position uncertainty of the object echoing the ultrasonic signal.

When the relevant distance measurement in the given direction is performed it is not possible to determine the exact position of the object. The signal reflecting object A can be situated somewhere along the arc with the radius of the measured distance and arc

angle equal to the radiation cone angle, for example in the position **A**'. Also it is not possible to detect, if the ultrasound signal was reflected by another object **B**. When the distance measurement is obtained, the object position uncertainty is consequently solved by considering the placement of obstacles along the whole length of the circular arc. Therefore, in robot environment representation, there are updated all grid cells corresponding to radiation cone arc in the measured distance.

For modelling of the uncertainty given by the wide radiation cone of the sonar sensor in angular resolution, an angular radiation function f_a is introduced [4], [7]. Since the intensity of the ultrasonic waves decreases to zero at the borders of the radiation cone, the degree of certainty of some area to be occupied by obstacle or to be empty, is assumed to be higher for points close to the radiation cone axis. This is realised by the angular modulation function

$$f_a(\theta) = \begin{cases} P(\theta) & , 0 \leq |\theta| \leq \theta_k \\ 0 & , |\theta| > \theta_k \end{cases} \quad (1)$$

where $P(\theta)$ is the radiation directivity function [2], [4], θ is angular distance measured with respect to the radiation cone axis and θ_k is limiting angle of the radiation cone of given sensor. The important value of the sonar so-called *limiting angle* can be computed from certain intrinsic parameters of the sonar. In general the limiting angles of the radiation cone are dependent on the ultrasound wavelength and the radius of active element of the sensor [2].

Mathematical model of angular uncertainty of measurement requires a knowledge of the angular range in which the sensor is able to detect an obstacle. Although the theoretical value of limiting angle for the sensor can be calculated, if the sensor parameters are unknown or a more precise value is needed for sensory model, the identification of the limiting angle is the only way of determining its real value.

2.1 Experimental ultrasonic measuring system

The ultrasonic measuring system is designed as a part of the sensor system of the mobile robot. The system was proposed to satisfy several requirements such as low demand on power supply and overall low weight. Moreover the technical design of the system emphasizes, simplicity, reliability and accuracy. The system achieved satisfactory experimental results with acceptable price level. It consists of the sonar and rotary platform which enables the sonar to set at an angle of desired direction during measurement. The rotary platform is driven by a stepper motor in the range of 360° with the step size of 0.9° . The technical solution of the ultrasonic system is based on the transmitter T40-16 and the receiver R40-16 by Nippon Ceramic Company [6]. The measuring range varies from about 10-15 cm to 3-4 meters and it is sufficient for navigation of the robot in a working environment. The ultrasonic measuring system is hierarchically divided into two parts. The sensing unit contains sensor and circuits of the transmitter and the receiver. The ultrasonic sensor consists of the separate transmitter (T40-16) and receiver (R40-16). The sensors have cylindrical shape with diameter of 16 mm and height of 12 mm. The resonance frequency of the sensor is 40 kHz. The sensing unit is linked to control unit based on the flexibly controllable RISC processor PIC16F873 clocked at 4 MHz. The control unit manages emission of ultrasound pulses and it also digitally processes the received signal. The essential parts of the experimental ultrasonic system are depicted in the Fig. 3.

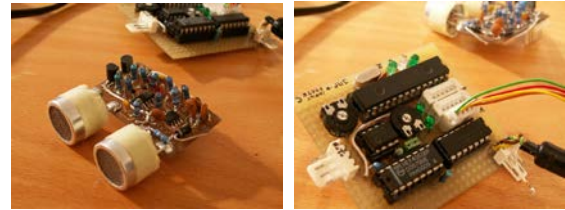


Fig. 3. Sensing and control unit of the experimental ultrasonic range finder.

3 Sonar identification method

Mathematical modelling of ultrasound sensor uncertainties requires accurate values of certain parameters of the used sensor. It is required to know the angular range in which the sensor can detect the obstacle. This value can be roughly determined from the sensor parameters given by the manufacturer or by its identification which is obviously more accurate. Any other methods for determination of the exact radiation cone angle of ultrasonic sensors were not found in available sources. Perhaps the only attempt to obtain this value by the measurements is published in [1]. Above facts lead to development of a method for determination of the size of the radiation cone angle. Identified value can be consequently used to create a precise mathematical model of the used sensor.

The aim was to determine the sensor parameter which is called the *effective angle of the radiation cone* (EARC). This parameter means the width of the radiation cone, which actually applies at the measuring distance to obstacles. After this manner the defined sensor parameter reflects practically usable ultrasonic signal cone angle. Identification of the EARC size is based on the conditions close to real situations of the ultrasonic sensor utilization. Thus measured beam angle is essentially identical to angle which applies in the mapping of an unknown area occupied with a number of obstacles of various quality and character. The determined value of radiation cone angle is the one maximally possible, which in view of scanning obstacles is the worst case of the horizontal angle uncertainty. In real environments, the reflecting conditions are worse in the vast majority of cases, as compared with those in identification measurement and smaller width of the radiation cone is applied in the reflection. Yet such cases can occur, hence the determined cone width is the searched sensor parameter. EARC identification principle is as follows and is shown in Fig. 4.

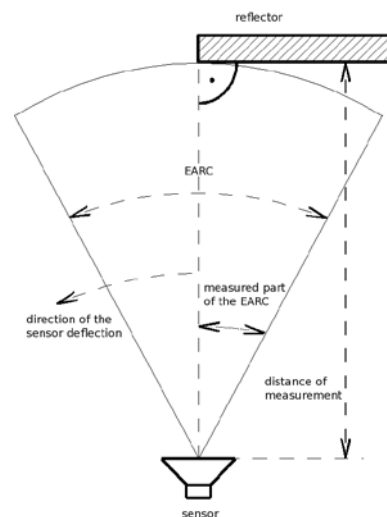


Fig. 4. Scheme for identification of effective radiation cone angle.

The ultrasonic sensor is placed pointing to the free space. Essential aim of the identification procedure is to measure the size EARC at different distances. Obtained values enable to determine whether the size of the radiation cone angle varies with distance. Therefore the reflector echoing sent ultrasonic signal is placed at chosen distances. Real obstacles in robot's working environment have different sizes and shapes. Moreover, the obstacles are formed from miscellaneous materials. The reflection of the signal by obstacle is strongly associated with the properties of its surface and it also depends on the angle at which signal hit the reflecting surface of the obstacle. The signal is reflected towards the transmitter if it hits the surface at an angle which is smaller than critical angle. Otherwise the signal is bounced away from the transmitter. It is important to consider these facts. The relative position of the sensor and the reflecting surface is chosen with the signal vertically impinging on the surface throughout the whole measurement. This selection effectively eliminates the surface properties of the reflecting object related to the critical angle. Such configuration is also ideal for a signal reflection and the maximum possible amount of energy transmitted into that direction returns back to the sensor. However, the surface properties play role even in such measuring configuration. If the surface has some absorption properties in relation to the ultrasonic signal, or if the surface has ability to distract the signal, only portion of the impinged signal returns back to the sensor. Therefore, in order to bounce maximum energy, a hard and smooth material is chosen as the reflective surface. The size of the reflector has also influence on signal reflection and it must be sufficiently large to simulate the ideal case of reflection, in which the maximum amount of acoustic energy is reflected to the receiver. The key element of the identification method is a mutual position of the sensor and reflector. The reflector is placed with its reflection surface plane being perpendicular to the axis connecting the sensor and the side edge of the reflector as shown in Fig. 4.

The ultrasonic signal beam spreads into the space in the form of radiation cone with spherical front part. The amount of acoustic energy gradually decreases from the cone axis to its boundaries. Determination of the radiation cone borders consists of gradually reducing amount of energy emitted towards the reflector. The requirement of vertical impingement on the reflector of gradually reduced ultrasonic signal is achieved by gradual deflection of the sensor. It is conveniently accomplished by horizontal rotation of the sensor with sufficiently small steps. The rotation begins from the base position with radiation cone axis directed perpendicularly to the reflecting plane and proceeds to one side as shown in the Fig. 4. At every step of the measurement the reflecting surface is vertically hit by diminished part of the signal and rest of the signal spread further into free space. Such gradual decrease in strength of the acoustic signal reaches the point, where the reflected signal is incapable to activate the receiver and the signal loss occurs. Thus the receiver is able to capture the echo to the particular measurement step. This sensor deflection threshold step determines a boundary of the radiation cone. This deflection step also defines limiting angle of the radiation cone at a given distance and within that angle the sensor is able to detect the presence of obstacles. Achieving the limiting angle is indicated by the absence of echoes in successive deflection steps or by measuring distances considerably greater than the distance to the reflecting surface. This case occurs if the signal is reflected from an object situated behind the reflecting surface. Therefore the measurement should be performed in an environment large enough to safely identify the source of reflection. After this manner only the limiting angle of the radiation cone at one side of the cone axis is obtained. The second limiting angle is analogously determined with placement of the reflector on the opposite side of the axis connecting the sensor with the edge of the reflector and by deflection of the sensor to the opposite side. In this way it is possible to determine the effective angle of the radiation cone for any ultrasonic sensor with sufficient accuracy.

4 Experimental results

The experiment was performed in a relatively large open room. The necessary tools were arranged as it is shown in the Fig. 4. As the reflecting surface was chosen a smooth board with dimensions 1.5×0.6 m. The experimental ultrasonic measuring system was placed at height of 1 m to exclude theoretical possibility to capture the reflection from uneven floor. Reflecting surface was placed at regular distance intervals with a step 0.25 m in the range from 0.5 to 3 m. The sensor was deflected from the zero position when the cone axis is perpendicular to the reflecting surface plane (Fig. 4), to maximal deflection of 90° with increments by 0.9° . Distances obtained by turning the sensor from the zero position to a maximum deflection of 90° , and accordingly backward to the zero position, were recorded in one measurement. This procedure was repeated 10 times for each measuring. By this manner 20 distance values for each sensor deflection step were obtained. In the evaluation process of measurements, the angle of the sensor deflection presenting a loss of reflected signal was considered as the angular limit of the EARC. Irregular receipt of the reflected signal was observed for deflections in the vicinity of EARC edge. It was manifested as various number of distance values corresponding to reflection as well as loss of signal. The value which appropriately represents the collected measurements for each sensor deflection angle allow to identify the boundaries of EARC. The median of the data set is such suitable representational value, because it determines the predominant number of measured distances. To verify the symmetry of EARC, the experiment was carried out also for the second side of the radiation cone. Subsequently two EARC limit values for given distance from the sensor were obtained, corresponding to the left and to the right side of the cone. The sensor limiting angles are listed in Table 1 and the medians of the measured data sets are shown in Fig. 5.

Table 1. Measured values of the left and right limiting angle of the Nippon sensor.

Measuring distance [m]	Left limiting angle [$^\circ$]	Right limiting angle [$^\circ$]
0.50	46.8	39.6
0.75	42.3	38.7
1.00	39.6	34.2
1.25	36.9	31.5
1.50	33.3	35.1
1.75	34.2	31.5
2.00	32.4	27.9
2.25	31.5	24.3
2.50	28.8	26.1
2.75	27.0	22.5
3.00	27.0	25.2

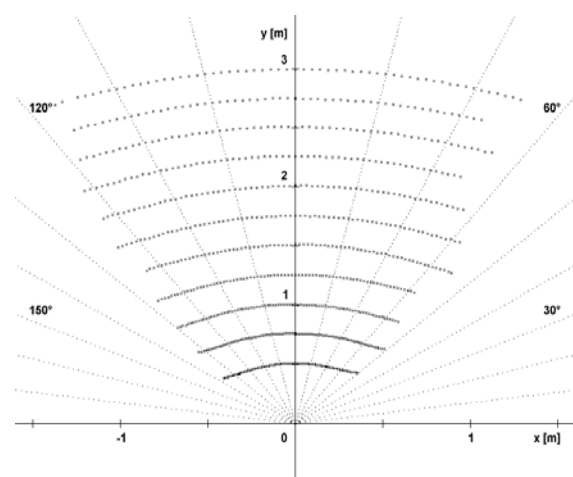


Fig. 5. Results of the EARC identification of the Nippon sensor.

The measurement results show the properties of the used sonar. The Nippon sensor has significantly wide cone angle. Founded values of its width gradually decrease with increasing distance and they move in the range of about 40° to 25° , which is well documented in the Table 1 and Fig. 5. It can be concluded that a significant portion of the transmitted acoustic signal is absorbed in the environment along the edges of the cone with increasing distance to the obstacle. Thus the sensor shows a considerable decrease of the EARC parameter with the change of the measured distance and therefore it is suitable for measuring shorter distances. However a maximal distance of 3 m is sufficient for practical navigation of smaller mobile robot. The observed data suggest that the cone beam is only slightly asymmetric in respect to the radiation cone axis.

5. Conclusion

Motion of the mobile robot in the environment is dependent on information acquired by its sensory system. The sensory system of common mobile robot is usually equipped with ultrasonic range finders. These are used to measure a distance from the robot to a nearby obstacle in a given direction. The main disadvantage of the ultrasonic sensor is considerable amount of uncertainties of various type embedded in the sensed data. Processing of the uncertain data results in inaccurate information about the environment. Therefore minimisation of this uncertainty leads to the more accurate environment models and to improved robot motion in the working environment. The sensor model is a key element in the processing of gathered distance data into the environment representation. The mathematical models of the ultrasonic sensors used in mobile robotics are based on the angular width of the sensor radiation cone. The most accurate value of this parameter is obtained by identification of the sensor really used. Therefore development of reliable sonar identification procedure was necessary. The identified parameter is the sonar effective angle of the radiation cone as the function of the measuring distance. Determination of this functional relation is accomplished by a proposed identification method. The procedure was successfully applied to identify the cone width of the experimental ultrasonic sensor. Acquired data revealed constriction of the radiation cone with increased measuring distance and its asymmetric shape. The knowledge of these facts consequently simplifies the robot navigation tasks and makes them safer.

Literature:

1. Cao, A., Borenstein, J.: *Experimental Characterization of Polaroid Ultrasonic Sensors in Single and Phased Array Configuration*. Proceedings of the UGV Technology Conference at the 2002 SPIE AeroSense Symposium, Orlando, FL, April. 1-5, 2002.
2. David, J., Cheeke, N.: *Fundamentals and Applications of Ultrasonic Waves*. CRC Press, April 18, 2002. pp. 480. ISBN 0-8493-0130-0.
3. Elfes A.: *Using occupancy grids for mobile robot perception and navigation*. Computer Magazine, June, 1989. pp. 46-57.
4. Gambino, F., Oriolo, G., Ulivi, G.: *A comparison of three uncertainty calculus techniques for ultrasonic map building*. 1996 SPIE International Symposium on Aerospace/Defense Sensing and Control-Applications of Fuzzy Logic Technology III, Orlando, USA, 1996. pp. 249-260.
5. Moravec, H., P., Elfes, A., E.: *High Resolution Maps from Wide Angle Sonar*. 1984. Proceedings of the 1985 IEEE International Conference on Robotics and Automation, St. Louis, USA. March, 1985. pp. 116-121.
6. Nippon Ceramic Co., Ltd.: *Air Transmission Ultrasonic sensor*. Catalog, 2002. http://www.nicera.co.jp/pro/ut/html_e/ut-001e.htm
7. Oriolo, G., Ulivi G., Venditelli, M.: *Fuzzy maps: A new tool for mobile robot perception and planning*. Journal of Robotic Systems, vol.14, no. 3, 1997. pp. 179-197.
8. Ribo, M., Pinz, A.: *A comparison of three uncertainty calculi for building sonar-based occupancy grids*. Robotics and Autonomous Systems, vol. 35, no. 3-4, July, 2001. pp. 201-209.

Primary Paper Section: I

Secondary Paper Section: JB, JD, BI

EMEE – WELL-FOUNDED FEEDBACK IN LEARNING MANAGEMENT SYSTEMS

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Abstract: This paper gives an introduction to effective monitoring and evaluation of education. Well-founded feedback called EMEE (Effective Monitoring and Evaluation of Education) represents an interdisciplinary project combining an informatics approach with mathematical and pedagogical methods. The EMEE idea is based on an innovative feedback method integrated into an appropriate learning management system. The added value lies in new information for teachers discovered by data mining, statistical and analytical data processing. The result will be clearly visualized in diagrammatic form (graphs and tables). EMEE functionalities will be available in the most widespread and most popular LMS Moodle. All fundamental principles including the conceptual database model are described in this paper

Keywords: feedback, learning management system, analytic tool, e-learning, Moodle

1 Introduction

Electronic support of teaching contains many sophisticated features for improving education. A learning management system (LMS) is a specialized online environment, which covers basic and advanced e-learning innovative elements and often is connected to the agenda of the administration. The term LMS represents software for delivering, tracking and managing training. LMSs range from systems for managing training records to software for distributing courses over the Internet and offering features for online collaboration. In many instances, corporate training departments purchase LMSs to automate record-keeping as well as the registration of employees for classroom and online courses. These systems are very important in education in particular. Using an LMS can offer many benefits. It provides uniform learning content, enriches the learning experience, increases student participation, manages content delivery and, by using standardized content formats, users can share course content. The business use of an LMS can also reduce training costs, increase employee competency and the flexibility of a training agenda, decrease employee turnover and manage learning facilities in conjunction with human resources goals. Due to survey (1) instructors and students believed that an LMS improved teaching and learning, although students were less positive about the effect of an LMS on instructors' teaching. There are also other benefits of using an LMS in education that are proven by this survey – for instructors it is improvement in communication with students and for students it is efficiency (saving time). However, 26% of instructors choose “efficiency (saves time)”, which indicates that efficiency is important to many instructors as well as their students.

An LMS may contain information about how long it would take to work through self-study material and the length of face-to-face courses. An LMS may give immediate access to e-learning material, it may enable people to register for a face-to-face course, and it may dispatch other forms of study material. An LMS may monitor progress and provide a record for learners on how they are doing, perhaps against their own original target or against others. For the learner the LMS gives access, feedback, and a planning tool (2). One could use the data administrated in an LMS to predict the time required by the learner as a total and in hours per week, given a target for when the training has to be complete. As LMSs continue to evolve and gain popularity, further research is needed to help instructors and students identify the most effective ways to use these technologies to improve teaching and learning, and not only in higher education. There seems to be great opportunity to develop an original feedback module for a convenient and well-arranged overview of students' activities and results.

1.1 LMS feedback functions and analytic tools

Many educators expend enormous amounts of effort in designing their learning to maximize the value of those interactions. Regardless of the approach taken, a series of questions consistently arises: How effective is the course? How can the needs of learners be better supported? What interactions are effective? How can they be further improved?

The evaluation and analysis of learning has suffered from: the limited quantity of data that busy students and instructors are willing to share at the end of a course; the limited quality of this self-reported, retrospective data; and a significant delay (normally at least one semester) between the events being reported and the implementation of an intervention. However, as an increasingly large number of educational resources move online, an unprecedented amount of data surrounding these interactions is becoming available. For example, the amount of time spent reading content online can easily be captured by an LMS. When, why and with whom learners are connecting is also logged in discussion forums and social networking sites. There exist numerous other parameters which can be very useful for applications of data mining methods and subsequent appropriate analytical processing. The EMEE concept works with data stored in LMSs and effectively visualizes interesting relations and significant differences. It is a new kind of educational technology, which can be used to improve learning and teaching. It draws from, and is closely tied to, a series of other fields of study including business intelligence, web analytics, academic analytics, educational data mining, and action analytics (3).

The challenge with respect to data-gathering hardware and software is the integration of these diverse data sources. Open architecture solutions are therefore required that are capable of scraping data, information, and context from administrative and academic systems as well as from structured and unstructured data, information, and context contained in assessment solutions (4). If LMS data were correlated with additional information gathered in other systems, a richer picture of the student learning experience, instructor adoption, and institutional usage could be generated. It could in fact be possible to track individual activity throughout the entire student life cycle – from initial admission, through course progression, and finally graduation and employment transitions (5).

2 Quality of education

The World Declaration on Education for All (1990) and the Dakar Framework for Action (2000) – the two most recent United Nations conference declarations focusing on education – recognize quality as a prime condition for achieving Education for All. The Dakar Framework affirms that quality is “at the heart of education”. It goes on to say, “What takes place in classrooms and other learning environments is fundamentally important to the future well-being of children, young people and adults. A quality education is one that satisfies basic learning needs and enriches the lives of learners and their overall experience of living.” Despite a growing consensus about the importance of quality, there is much less agreement on what the concept means in practice. Two principles, however, characterize most attempts to define the quality of education. The first, which identifies learners' cognitive development as the major explicit objective of all education systems, sees the success with which learners achieve this as one indicator of their quality. The second emphasizes the role of education in promoting commonly shared values, and creative and emotional development – objectives whose achievement is much more difficult to assess (6).

One of the most important aspects to ensuring the rising quality of education, and not only in the academic sphere, is feedback from students to the teacher. Today many teachers use various online environments such as LMS systems. The feedback process without computer assistance is extremely time-

consuming, and there is no complex reporting application that can be fully integrated into learning management systems and provide substantiated reports to teachers.

2.1 Importance of feedback

Student support and cooperation in education is one of the areas in which e-learning differs from traditional teaching approaches. In the event that education is mostly or completely in the form of distance learning, students learn mostly by interaction with the system. Laurillard's conversational theory promotes an approach where the education is accompanied by interactions between the student and teacher. This theory also emphasizes the constructive and meaningful feedback that allows students to reflect on teaching methods and materials (7).

Feedback helps teachers to better set targets for their students, creates independent student learners and, in the process, raises students' performance levels. In order to have sustainable change in teachers' practice they must be provided with ongoing opportunities for learning, including trying new strategies, followed by reflection and discussion with peers. Throughout feedback teachers can think and work "smarter," structure learning experiences that fully engage the learner, and, most of all, provide the steps for the intended one. Learning involves taking risks, supporting each other, looking for evidence of progress and adjusting one's plans (8). The importance of feedback also lies in teachers' perceptions of the collective efficacy of the teachers in their schools. Appraisal and feedback have a strong positive influence on teachers and their work. Teachers report that it increases their job satisfaction and, to some degree, their job security, and it significantly increases their development as teachers. The greater the emphasis on specific aspects of teacher appraisal and feedback, the greater the change in teachers' practices to improve their teaching. In some instances, more emphasis in school evaluations on certain aspects of teaching is linked to an emphasis on these aspects in teacher appraisal and feedback which, in turn, leads to further changes in teachers' reported teaching practices (9).

3 Effective monitoring and evaluation of education

The underlying concept of EMEE is the idea of a clear arrangement of different feedback features, giving the teacher well-founded information on student behavior during the education cycle. A standard component of the learning management system (LMS) is access to statistics for different learning objects which, when combined with other information available, can be used for interesting statistical and analytical investigations. The key in this is the utilization of all data of informative value related to student activities, with subsequent storing of the data in a newly designed database structure. Through sophisticated mechanisms and selected data retrieval methods, student behavior can be mapped during different stages of studies – typically in semester cycles. The application of these principles in different learning management systems is specific mostly because each environment has, to a certain degree, a different data structure and has been created by using a different programming tool.

3.1 Conceptual data model

The basis conceived for the design of the database solution is a conceptual data model. The advantage of the scheme is its generality and hence the independence of the selected implementation. A direct implication is that the scheme can be applied in any environment regardless of the programming tool and database type used. The model defines relations between different entities, selected in this case to ensure that the entire learning cycle can be generally described.

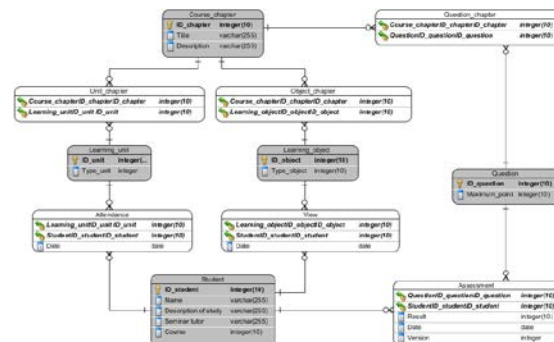


Fig. 1. Conceptual model showing how data is organized in EMEE. For illustration, associative entities are differentiated and marked with a white background.

The *Student* entity describes through different attributes all major features which are necessary to know for further processing. Initial parameters are unambiguous student identification, including name, description of studies, teacher and course repetition indicator.

The *Course_chapter* entity determines a wider cycle for the topic during the semester. It is clearly identified through its *ID_chapter*, and for the sake of clarity and easier understanding also the Title and Description attributes are at hand. It is always a compact learning area to which learning objects and student activities are related.

The actual learning objects are represented in the model by the *Learning_object* entity, which contains, besides the primary key *ID_object*, the *Type_object* attribute where numeric values are used to specify the type of learning material (textbook, lecture materials, exercise materials, teaching tutorials, video records, etc.).

Lectures, exercises and seminars are represented by the *Learning_unit* entity which, again, contains the *Type_unit* attribute besides the primary key *ID_unit* for precise identification of the learning unit. Examples include a lecture, a seminar, or practical training.

The key student activity during the semester is shown through coupling (associative) entities Attendance and View. In the Attendance entity, a new record appears if the student has not been physically present at a lecture or training. In the View entity, a new record appears if the student has accessed the particular learning object.

It is logical that each learning object and each learning unit are related to one of the thematic blocks. The link between the learning chapter and learning unit/object is represented by coupling entities *Unit_chapter* and/or *Object_chapter*.

Different questions forming part of different test specifications are represented by the Question entity. Besides the primary key *ID_question*, this entity features the Maximum attributes (maximum possible point gain). If the student comes to a test, the associative entity Assessment keeps information on the point gain of the respective student within different questions of the task. It is obvious that each question must be incorporated into any of the learning chapters. This relationship is represented by the *Question_chapter* coupling entity.

3.2 Work with data

The model designed in this way enables access to data via SQL queries. Variability and possible modifications of the database structure are very easy thanks to the generality of the design, so it can be customized for the LMS system which is in use. A practical showcase of access to data are the following examples, applied within the EMEE pilot project at Faculty of informatics Masaryk university:

Example 1

```

SELECT DISTINCT
question.maximum_point,
assessment.points,
assessment.student_ID

FROM
chapter_course,
question_chapter,
question,
assessment

WHERE
chapter_course.id_chapter=question_chapter.id_chapter AND
question_chapter.id_question=question.id_question AND
question.id_question=assessment.id_question AND
chapter_course.id_chapter= 'chapter_11'

ORDER BY ID

```

The SQL query in example 1 returns gained points and possible maximums ordered according to the *ID_student* attribute. These are only questions belonging to thematic chapter 11.

Example 2

```

SELECT
assessment.id,
assessment.points,
assessment.id_question

FROM
assessment,
question

WHERE
assessment.id_question= question.id_question AND
assessment.id='123456' AND
assessment.date='2011_01_05'

```

The SQL query in example 2 returns the point count for different questions on a test from 5 January 2011 answered by a student with identification number 123456.

3.3 Practical use

EMEE – Effective Monitoring and Evaluation of Education has been already applied in practice within a large-capacity course at the Faculty of Informatics of Masaryk University where the data pool for further processing was provided by the Information System of Masaryk University, belonging to the LMS systems category. Data collection, editing, organization in the database and analysis were prepared, to a large degree, on an experimental basis by adopting manual procedures and simple scripts (10). The output of this pilot project was a set of statistical and analytical investigations which gave the teacher a realistic view of the teaching and vital feedback. An example can be found in the two charts showing the application output for multiple statistical and analytical methods for available data. Figure 2 shows the average point gain of students expressed in percentage points on questions from the respective chapter. The students were divided into two groups: students attending a lecture devoted to a chapter topic (grey column) and students not attending (white column). The total of all columns of the respective color always indicates 100% = all attending/non-attending students in the lecture.

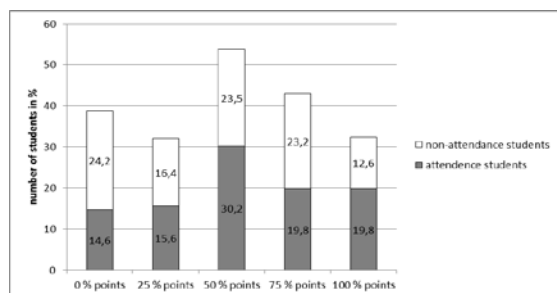


Fig.2. Chart showing correlation between average results on questions from the respective chapter on attendance of a lecture (11).

The chart in figure 3 demonstrates the point gain of students in a final test (maximum 40 points) depending on how active they were over their learning cycle. The students were divided into four groups:

- Active students – students who have attended at least 75% of lectures;
- Lightly active students – students who have attended at least 50% but less than 75% of lectures;
- Lightly passive students – students who have attended at least 25% but less than 50% of lectures;
- Passive students – students who attended less than 25% of lectures.

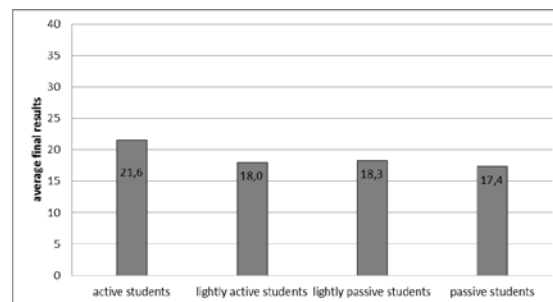


Fig.3. Chart showing correlation between average results and student activity during lessons (11).

A comprehensive list of charts and tables from the project at the Faculty of Informatics can be found in the diploma thesis of M. Komenda with the title Monitoring and Evaluation of Education Forms in IT.

3.4 Generalization of EMEE

The previous chapter provides evidence that the EMEE concept is fully applicable in practice. One fact is that almost all adjustments related to data retrieval from the LMS system as well as subsequent processing have not yet had any conceptual or systemic solution. Therefore, it is desirable to take a more general look at EMEE and calculate with the idea of maximum possible automation. This would mean that for example selected functions could be available in the teacher's standard environment (LMS) which the teacher is using in his/her e-learning agenda. Based on past experience, EMEE can be divided into the following four phases:

1. Data retrieval from LMS on student behavior during the learning cycle.
2. Selection of useful data and its organization in the database.
3. Statistical and analytical processing.
4. Presentation of output.

Each of the above steps correlates to a certain degree with the environment in which EMEE is to be implemented. Now it is essential to design a specific application enabling efficient and effective feedback to the teacher on his/her students. The technical solution to communication with the selected LMS is subject to further development. Since the architecture of LMS systems is not standardized and hence varies significantly, no uniform and fully compatible solution can be developed. Development will always have to be customized for the system supporting the e-learning agenda. What will play the key role prior to implementation will certainly be the analysis and collection of requirements from teachers who themselves want to use this functionality (10).

4 Integration of EMEE into the Moodle system

Selection of the right development and integration system for EMEE was a relatively easy task. In recent years, the popularity of open-source software products has been growing. The most popular choice in the area of learning management systems is without any doubt the Moodle LMS. Also available of course are alternatives such as Claroline, Dokeos, ILIAS, ATutor, SAKAI, etc. In its number of installations and thanks to its large community, Moodle can confidently claim the leading role. Teachers and students all over the world know and enjoy this e-learning management system. In the Czech academic environment Moodle is also widely used, which is why it was selected as the environment for which the actual EMEE module was developed and integrated. The new separate module Moodle-EMEE will fully correspond with the license policy of Moodle and will be distributed free of charge in the open-source format under the GNU General Public License.

Like most software solutions, also Moodle-EMEE will undergo a development life cycle. One essential development phase is demand specification. This phase is crucial for successful completion and implementation. Extremely high emphasis will be placed on correct specifications to ensure seamless application. For this reason, a survey has been carried out among the public with the objective of collecting suggestions and ideas about the functionality of the model from the teachers for who this model will be relevant. As the function and output variability connected with data describing student behavior is rather broad, a targeted feedback should provide a list of the most desired features to be used as the core of the first version of the Moodle-EMEE analytical model. Tutors and teachers will have the opportunity to influence how the application will look in practice.

The target group in this survey are experts and senior users of the e-learning tool at universities.

- Users of LMS Moodle – teacher community working with the open-source system Moodle who attended the MoodleMoot.cz 2011 conference.
- Users of LMS systems from academic and commercial institutions (collaboration with Pragodata Consulting s.r.o.).
- Selected teachers across the MEFANET education network (pooling all Czech and Slovak medical faculties).
- Selected teachers working at the Institute of Biostatistics and Analyses at Masaryk University.
- Attendees of the Summer School of Applied Informatics 2011 in Bedřichov.
- Teachers from LaSARIS (Lab Software Architectures and Information Systems).
- Selected active teachers at Masaryk University engaged in e-learning over the long run (10).

5 Conclusions

This paper described a brand-new EMEE concept which shifts learning feedback to better optimization from the point of view of the end user. Without the need for complicated and often bothersome questionnaires and surveys, the teachers will have a tool providing a well-founded and hence valuable picture of their teaching. The pilot experiment showed clearly that the proposed principles are applicable in practice and the output opens not only an objective insight into student behavior, but also follow-up modification of teaching methods. Another logical step is the development of a new module for the LMS system environment – specifically for Moodle. Moodle-EMEE will give teachers feedback options not only on student activity but also and firstly on their own teaching. The entire chart and table output will be presented in anonymized form, used only for optimization purposes and continuous quality improvements in

the teaching process. If successfully applied in the Moodle system, further spill-overs into closed university environments are foreseen. A vital prerequisite for future incorporation of advanced functionalities and new requirements is collaboration between teachers prior to implementation.

Literature:

1. Lonn, S., Teasley, S. D.: *Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems*, Computers & Education, Volume 53, Issue 3, November 2009, Pages 686-694, ISSN 0360-1315, 10.1016/j.compedu.2009.04.008. Available at www: <<http://www.sciencedirect.com/science/article/pii/S0360131509001006>>
2. Hills, H.: *Learning Management Systems: Why Buy One?*. Training Journal, 2003, no. 14656523. pp. 12-12 ProQuest Central. ISSN 14656523.
3. Elias, T.: *Learning Analytics: Definitions, Processes and Potential*. In Learning and Knowledge Analytics [online]. January 2011 [Accessed: 2011-11-23]. Available at www: <<https://tekri.athabascau.ca/analytics/>>.
4. Norris, D., Baer, L., Leonard, J., Pugliese, L. and Lefrere, P.: *Action Analytics: Measuring and Improving Performance That Matters in Higher Education*, EDUCAUSE [online]. Review 43(1), 2008. [Accessed: 2011-11-23]. Available at www: <<http://www.educause.edu/EDUCAUSE+Review/EDUCAUSEReviewMagazineVolume43/ActionAnalyticsMeasuringandImp/162422>>
5. Dawson, S.: *"Seeing" the learning community: An exploration of the development of a resource for monitoring online student networking*. British Journal of Educational Technology, 2010, 41(5), 736-752. doi:10.1111/j.1467-8535.2009.00970.x.
6. *EFA Global Monitoring Report 2005: Education for All: The quality imperative* [online]. France: UNESCO Publishing, 2004 [Accessed: 2011-11-24]. Available at www: <<http://unesdoc.unesco.org/images/0013/001373/137333e.pdf>>.
7. Laurillard, D.: *The educational challenges for teachers and learners*. Paper presented at Virtual University Conference, 24 May 1996, University of London, England.
8. Sutton, R. and Clarke, P.: *Feedback for Learning*. Toronto, 2006, ProQuest Central.
9. *School Evaluation, Teacher Appraisal and Feedback and the Impact on Schools and Teachers*. In Creating Effective Teaching and Learning Environments: First Results from TALIS [online]. 2009 [Accessed: 2011-11-23]. Available at www: <<http://www.oecd.org/dataoecd/32/8/43541664.pdf>>. ISBN 978-92-64-05605-3.
10. Komenda, M., Pekárková, L.: *EMEE integration into learning management system*. Summer school Bedřichov 2011.
11. Komenda, M.: *Monitoring and Assessment of Teaching Manners in Informatics*. Diploma thesis. 2010.

Primary Paper Section: I

Secondary Paper Section: AM, IN

J INDUSTRY

IN	INFORMATICS
JA	ELECTRONICS AND OPTOELECTRONICS
JB	SENSORS, DETECTING ELEMENTS, MEASUREMENT AND REGULATION
JC	COMPUTER HARDWARE AND SOFTWARE
JD	USE OF COMPUTERS, ROBOTICS AND ITS APPLICATION
JE	NON-NUCLEAR POWER ENGINEERING, ENERGY CONSUMPTION AND UTILIZATION
JF	NUCLEAR ENERGY
JG	METALLURGY, METAL MATERIALS
JH	CERAMICS, FIRE-PROOF MATERIALS AND GLASS
JI	COMPOSITE MATERIALS
JJ	OTHER MATERIALS
JK	CORROSION AND MATERIAL SURFACES
JL	FATIGUE AND FRACTURE MECHANICS
JM	STRUCTURAL ENGINEERING
JN	CIVIL ENGINEERING
JO	LAND TRANSPORT SYSTEMS AND EQUIPMENT
JP	INDUSTRIAL PROCESSES AND PROCESSING
JQ	MACHINERY AND TOOLS
JR	OTHER MACHINERY INDUSTRY
JS	RELIABILITY AND QUALITY MANAGEMENT, INDUSTRIAL TESTING
JT	PROPULSION, ENGINES AND FUELS
JU	AERONAUTICS, AERODYNAMICS, AEROPLANES
JV	COSMIC TECHNOLOGIES
JW	NAVIGATION, CONNECTION, DETECTION AND COUNTERMEASURE
JY	FIREARMS, AMMUNITION, EXPLOSIVES, COMBAT VEHICLES

THE PROBLEM OF DETERMINING THE VOLUMES USING MODERN SURVEYING TECHNIQUES

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Abstract: The paper deals with the investigation of accuracy of a volume estimation based on the digital elevation model generated from the sets of points with different densities. Investigation of the influence of the point density is provided on the basis of the theoretical bodies, which surface is expressed using a known mathematical function of the planar coordinates, and on the experimental measurements using terrestrial laser scanning and GNSS-RTK method. The results achieved suggest that the density of points significantly affects the accuracy of a volume determination.

Keywords: volume, digital elevation model, density of points, terrestrial laser scanning, GNSS-RTK

1 Introduction

A calculation of the volumes belongs among the common requirements of the construction and mining industry. To determine a volume we can use different methods and their selection depends on the type and dimensions of an object, character of the border areas, the possibility of the data collection and also on the instrumentation and software.

One of the possibilities of determining a volume between a topographical surface and a reference plane or surface represents a calculation based on the digital elevation model (DEM). However, the accuracy of the DEM based volume calculation depends on the quality of the DEM, which is a function of number variables such as the roughness of the terrain, the interpolation function and interpolation method and the three attributes (accuracy, density and distribution) of the source data [3], [4].

To collect the spatial data needed for a volume calculation, different measurement techniques may be used. In terms of the financial costs and availability, the most commonly used collection method in practice is a conventional surveying method using a total station and the methods based on the GNSS technology. The main disadvantages of these two methods may be seen in a low density of the points, the need to be in a contact with an object and high time consuming. At present, to the fore has also been coming an exploitation of the terrestrial laser scanning (TLS) and digital photogrammetry. Their advantage is the quick and contactless collection of spatial data with a sufficient density. On the other hand, the disadvantage is the need of filtering the unwanted ambient vegetation and objects. The main objective of this paper is to assess the effect of the density of input data on the DEM based volume calculation. To assess this impact, different approaches may be applied. The absolute assessment can be made on the bodies, whose surface is generated using known function of the planar coordinates and their exact volume can be calculated using integral calculus [5], or on the bodies, which exact volume is known. On the other hand, comparing the results obtained from the measurements with different densities of the input data or comparing with the results from different methods, the relative accuracy can be determined [1], [2]. Submitted paper consists of two parts; the first is devoted to analysis on the theoretical surfaces, the second part is focused on the analysis based on the results of the experimental measurements using GNSS-RTK method and TLS.

2 Analysis on the theoretical bodies

For this purpose, we defined a rectangular area with the dimensions 20 x 30 m and its origin is given the planar coordinates $x=0$ m and $y=0$ m (figure 1). Subsequently, within this area and on its borders, we created the sets of points with a density of 0,02 to 2,00 m (figure 1).

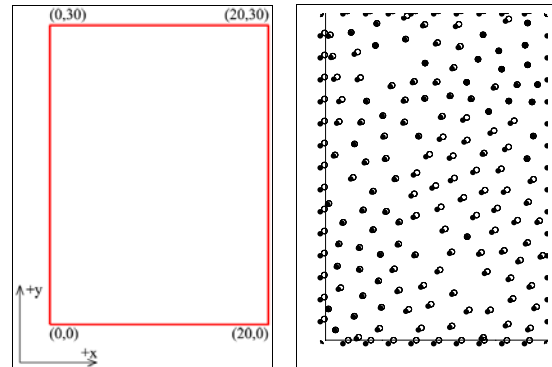


Figure 1: Defined area (left) and a set of points with a density of 2,00 m (right)

In order to create the theoretical surfaces over the defined area, we used two functions for all sets of points:

- theoretical surface A: $z(x, y) = \sqrt{\frac{x \cdot y}{10}}$,
- theoretical surface B: $z(x, y) = 5 - \left\{ \frac{(x-10)^2}{10^2} + \frac{(y-10)^2}{10^2} \right\}$,

where x and y are the planar coordinates of points. Based on these sets of the spatial coordinates of points, we finally created the digital elevation model using the Surfer software. For the interpolation we used the Kriging method and the grid size was adjusted according to the density of the source data. Graphical representation of the contoured maps and DEMs of both theoretical surfaces are shown in figures 2 and 3.

Calculation of the volumes from the generated DEMs was also carried out in the Surfer program using the cross-section method. As a reference plane we chose a horizontal plane with the height 0 m. The correct values of the volumes were determined based on the integral calculus, for the theoretical surface A 2065,59 m³ and for the theoretical surface B 2200,00 m³. The results obtained for both theoretical surfaces are shown in table 1. Within the table are also given the values of the relative errors calculated by means of the following formula:

$$r = \frac{V_{IP} - V_{DEM}}{V_{IP}} \cdot 100,$$

where r is the relative error in [%], V_{IP} – the volume calculated using the integral calculus, V_{DEM} – the volume determined by cross-sections from the DEM. Graphical representation of the dependence of the volumes with changing density of the input data are shown in figures 4 and 5.

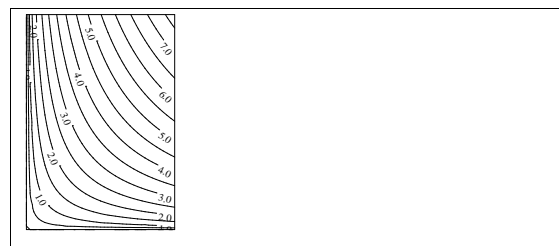


Figure 2: The contoured map and DEM of the surface A

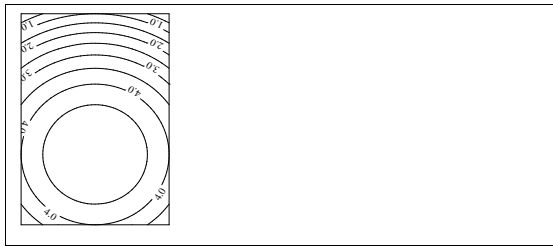


Figure 3: The contoured map and DEM of the surface B

Table 1: Determined volumes and relative errors for the theoretical surfaces A and B

Theoretical surface A			Theoretical surface B		
Density	V_{DEM}	r	Density	V_{DEM}	r
[m]	[m ³]	[%]	[m]	[m ³]	[%]
0,02	2065,12	0,02	0,02	2199,83	0,01
0,04	2065,12	0,02	0,04	2199,83	0,01
0,06	2065,09	0,02	0,06	2199,84	0,01
0,08	2065,04	0,03	0,08	2199,84	0,01
0,10	2064,95	0,03	0,10	2199,83	0,01
0,15	2064,70	0,04	0,15	2199,81	0,01
0,20	2064,37	0,06	0,20	2199,78	0,01
0,30	2063,53	0,10	0,30	2199,67	0,01
0,40	2062,54	0,15	0,40	2199,49	0,02
0,50	2061,43	0,20	0,50	2199,27	0,03
0,75	2057,87	0,37	0,75	2198,47	0,07
1,00	2053,97	0,56	1,00	2197,36	0,12
1,50	2045,10	0,99	1,50	2194,18	0,26
2,00	2034,65	1,50	2,00	2190,01	0,45

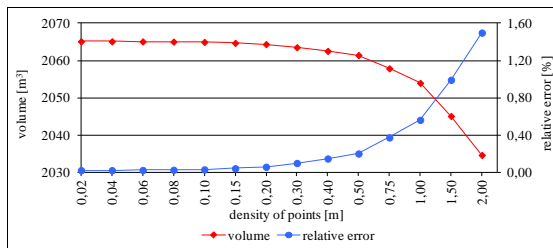


Figure 4: Dependence of the volume on the density of points – theoretical surface A

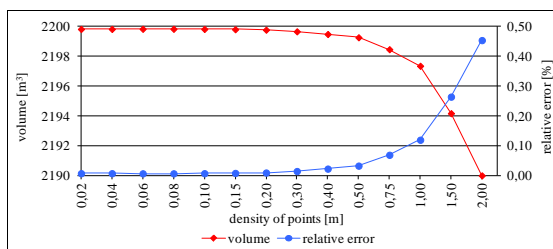


Figure 5: Dependence of the volume on the density of points – theoretical surface B

3 Analysis on the experimentally measured bodies

The aim of the experimental measurements was to assess the accuracy of volume estimation on the example of two piles of earth using different collection methods and under different densities of input data. These measurements were carried out on 7th of September 2011 on the dumping site at the Apollo bridge in Bratislava using TLS and GNSS-RTK method. For the measurement and subsequent analysis were chosen two newly poured piles of earth in the shape of an irregular truncated cone. The height of both piles of earth was roughly 3 m and the

diameter of a smaller pile was roughly 15 m and 30 m for a bigger pile.

3.1 Concept of the measurement

For scanning the piles of earth, we used the Trimble GX scanner (figure 6), which allows scanning to 350 m with speed up to 5000 points per second [7]. We defined the resolution of scanning 20 mm at 50 m and the orientation of the scanner was provided by measuring the planar targets. Scanning of the bigger pile of earth (PE-B) was performed from the 9 scanner stations (5001 – 5009) and to more detailed coverage of the upper part of the pile, 4 stations (5006 – 5009) were placed directly on its upper surface. The smaller pile of earth (PE-S) was scanned together from the 7 stations (5001 – 5003, 5007, 5010 – 5012), from which 2 stations were also on its upper surface (figure 7).



Figure 6: Scanning of the piles at the Apollo bridge in Bratislava

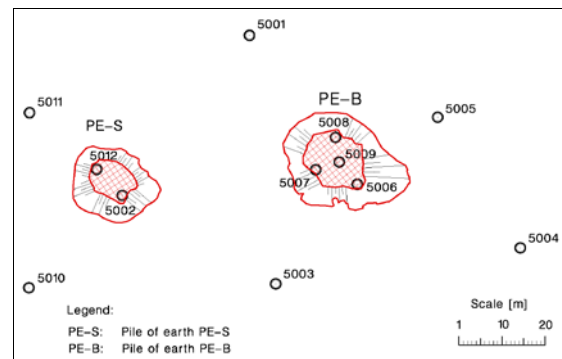


Figure 7: Layout of the scanner stations

Measurement of the piles by means of the GNSS-RTK method was performed using the dual frequency Trimble R6 receiver and the GNSS real-time positioning service SKPOS [6]. To ensure the same 3D reference system for the two data sets collected using GNSS-RTK and TLS, the coordinates and heights of points 5001 – 5012 were determined using GNSS-RTK method as well.

3.2 Data processing and volume calculation

Data from TLS were loaded into the Trimble Realworks software for processing. Because the scanner captures everything within its field of view, the point cloud was filtered of the unwanted ambient vegetation and objects (figure 8).

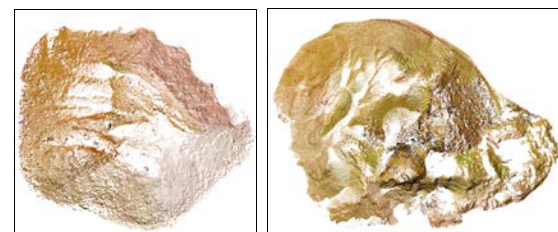


Figure 8: Filtered point clouds of the piles of earth

Thus prepared point clouds were exported into the sets of the spatial coordinates of points with a density from 0,02 to 2,00 m. Creation of the DEMs of the piles (figure 10), needed for calculating the volumes, was performed in the Surfer software environment using the Kriging interpolation method and with a grid size adjusted according to the density of the input data. Similarly, the DEMs from the GNSS-RTK data was also created (figure 11).



Figure 9: Photo of the PE-B

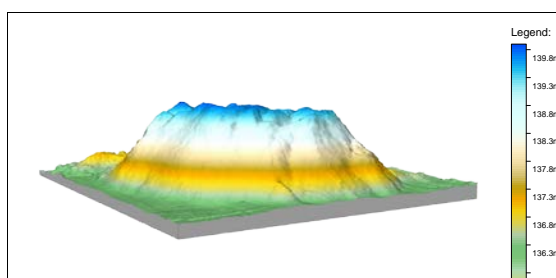


Figure 10: DEM of the PE-B from the TLS data with a density of points 0,10 m

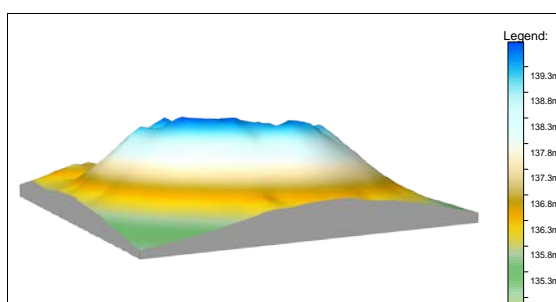


Figure 11: DEM of the PE-B from the GNSS data

Table 2: Determined volumes and relative errors for the piles of earth PE-S and PE-B

Pile of earth PE-S			Pile of earth PE-B		
Density	V_{DEM}	r	Density	V_{DEM}	r
[m]	[m ³]	[%]	[m]	[m ³]	[%]
0,02	394,65	-	0,02	678,69	-
0,04	392,99	0,42	0,04	676,56	0,31
0,06	391,58	0,78	0,06	672,80	0,87
0,08	390,22	1,12	0,08	668,95	1,44
0,10	388,59	1,54	0,10	664,88	2,03
0,15	385,89	2,22	0,15	661,81	2,49
0,20	383,20	2,90	0,20	655,63	3,40
0,30	378,08	4,20	0,30	641,51	5,48
0,40	373,08	5,47	0,40	635,72	6,33
0,50	371,12	5,96	0,50	629,27	7,28
0,75	363,83	7,81	0,75	625,69	7,81
1,00	358,98	9,04	1,00	617,69	8,99
1,50	349,68	11,39	1,50	602,49	11,23
2,00	347,68	11,90	2,00	593,87	12,50
GNSS	348,28	11,75	GNSS	600,31	11,55

The resulting DEMs of the piles of earth were used to calculate the volumes using the cross-section method in the Surfer software. As a reference plane we used a horizontal plane with the height 136,60 m for the PE-S and 136,30 m for the PE-B. The results obtained for the different densities of input data for both piles are shown in table 2. The table also contains the values of volumes obtained from the GNSS-RTK data created DEMs. The relative errors mentioned in table 2 are related to a volume determined from a set of points with 0,02 m density. Graphical presentation of the results is given in figures 12 and 13.

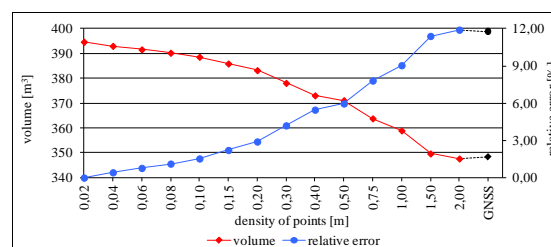


Figure 12: Dependence of the volume on the density of points – PE-S

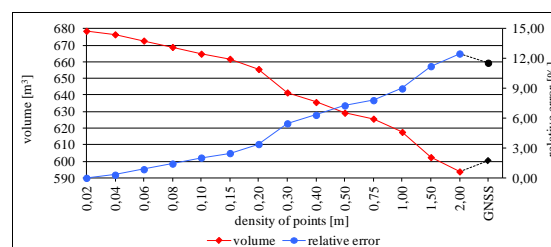


Figure 13: Dependence of the volume on the density of points – PE-B

4 Conclusion

This article was focused on assessing the accuracy of a volume determination from the point of view of a varying density of the input data and employed data collection method as well. The analysis was performed on the two mathematically defined surfaces and on the basis of the measurements realized using TLS and GNSS-RTK method.

In the case of the bodies, whose surfaces were defined by means of a mathematical function, the relative errors acquires maximum values 1,50% and 0,45% at the 2 m density of input data. On the other hand, in the case of the experimentally measured piles of earth, the relative error already overlays value 1% at the density of points 0,08 m and the maximum errors acquires values up to 11,90% for the PE-S and 12,50% for the PE-B. From a comparison of the volumes obtained from the TLS and GNSS-RTK data we can conclude that the relative errors acquires values roughly 11,50% and we assume that this result is due to an insufficient coverage of the surfaces of the piles of earth.

From the above mentioned results we can conclude that the density of points has a significant influence on the DEM based volume calculation. The density of the points is reflected in the approximation of a real surface, and therefore its influence increases with the roughness and complexity of the area of interest.

Literature:

1. Bajtala, M. – Brunčák, P. – Lipták, M. – Sokol, Š.: *Influence of the Density of Input Data on the Accuracy of a Volume Determination*. In: XVIII. Conference of the Society of Mine Surveyors and Geologists. Ostrava : VŠB – Technical University of Ostrava, 2011. ISBN 978-80-248-2489-5. pp. 5-12. (in Slovak).

2. Křemen, T. – Pospíšil, J. – Koska, B.: *Verification of the Relative Accuracy of a Volume Determination*. In: Sustainable Construction 5. Praha: CTU in Prague, 2009. (in Czech).
3. Li, Z. – Zhu, Q. – Gold, Ch.: *Digital Terrain Modelling: Principles and Methodology*. CRS Press, 2004. 323 pp. ISBN 0-415-32462-9.
4. Li, Z.: *Variation of the Accuracy of Digital Terrain Models with Sampling Interval*. In: Photogrammetric Record. 1992, vol. 14, no. 79, pp. 113-128.
5. Yanalak, M., Baykal, O.: *Digital Elevation Model Based Volume Calculations Using Topographical Data*. In: Journal of Surveying Engineering. ISSN 0733-9453, 2003, vol. 129, no. 2, pp. 56-64.
6. <http://skpos.gku.sk/>
7. www.trimble.com

Primary Paper Section: J

Secondary Paper Section: DH, JN

PROBABILISTIC MODEL OF LASER RANGEFINDER

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Abstract: The article deals with the design of a planar probabilistic model of laser rangefinder Hokuyo UTM-30LX which is widely used in mobile robotics. The reason for proposing such a model is the uncertainty in the distance measurements made by such sensors. Since the model is planar, the design of the model was divided into two partial models. The first partial model was established for the direction of the measurement and the second for the perpendicular direction to this measurement. The acquisition of the model parameters was carried out on the basis of numerous experiments.

Keywords: laser rangefinder, Gauss distribution, probabilistic model.

1 Introduction

Laser rangefinders are often used in many technical fields for the measuring of relative distances. They are advantageous for several reasons, such as ease of use, high accuracy, safety and efficiency. Thanks to these properties there is a wide range of potential applications of these sensors in various fields of science and industry. In the field of mobile robotics laser rangefinders are used to measure distances to obstacles around the robot. The reason for this is to provide collision-free motion and navigation in a known or unknown environment. Despite the aforementioned advantages, the measurement by a laser rangefinder is corrupted with errors. Therefore, the use of laser systems for the tasks that are performed by mobile robots (such as localization and mapping) brings for the variety of problems. These problems stem from the physical nature of the principle of laser systems operation. Consequently, their effective use requires detailed analysis of their properties and outline appropriate solutions to these problems. One solution is to improve the quality of information obtained from the laser rangefinder by the use of a mathematical model of the sensor, which this article deals with.

2 Principle of measurements using laser rangefinder

The laser rangefinder can operate on the principle of determining the time of flight (.ie. TOF) or the measurement of the phase shift between the sent and the received signal [1]. The implementation of laser rangefinders using phase shift is easier, cheaper, and therefore it is also more commonly used in practice. The laser rangefinder Hokuyo UTM-30LX, which was used in the experiments, works on the same principle. Thus, the following sections are devoted solely to this type of sensor.

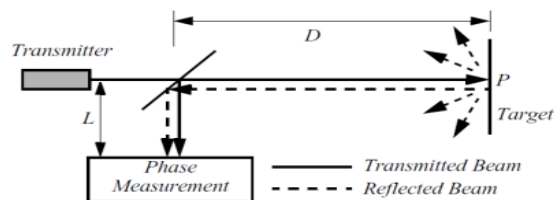


Fig. 1 Principle of laser measurement using phase shift method [1].

The measuring principle of phase shift laser rangefinder consists of sending a light beam towards the environment. The sent bordered beam of light reach the surface area of the object at point P. For a surface with a thickness greater than the wavelength of the sent light, the light reflect from the surface diffusively, which means that the reflection is nearly isotropic.

The wavelength of the transmitted light in the case of the Hokuyo sensor is about 900 nm. For the majority of surfaces this means that the emitted light is reflected from them diffusively. Exceptions are only a mirror or smooth shiny surfaces such as glass. The reflected component of the light is returned back to the reader nearly in parallel when compared to the sent beam. It is obvious that the sensor emits amplitude modulated light of known frequency and measures the phase shift between the sent and the received signal. The wavelength of the modulated signal can be determined according to the equation:

$$c = f \cdot \lambda, \quad (1)$$

where c is the speed of light and f is the modulated frequency.

The total distance traveled by the light in the environment can be expressed as:

$$D' = L + 2D, \quad (2)$$

where L and D are distances defined in the picture (Fig. 1). The distance between the detector and the object can be expressed as:

$$D = \frac{\lambda}{4\pi} \theta, \quad (3)$$

where θ is the measured phase shift between the sent and the reflected beam, λ is known wavelength of sent beam.

3 Parameters of laser rangefinder Hokuyo utm-30lx

The parameters stated by the manufacturer [2] (Table 1) are defined for a surface of exact size, situated perpendicularly to the beam of measurement. In practice it is often necessary to scan various kinds of surfaces from different angles, therefore it is necessary to experimentally verify the stated parameters for different surfaces and different angles of measurement. To complete the data necessary for the creation of the sensor model three types of experiments were performed. The first was focused on the repeatability of the measurement perpendicularly to the object, the second was aimed at the repeatability of the measurement under the angle of 45° and the third was aimed to the stability of the measurement of the edge of an object. The first two tests verify the stability of the measured distance, while the third test verifies the stability of the measured angle and the measurement on the border of two objects. The surfaces of cardboard boxes, plastic wicker surface, fabric, white paper, glossy white boards and black polished metal were used for these test.

Detection Range	Guaranteed Range: 0.1 ~ 30m (White Kent Sheet) Maximum Range : 0.1 ~ 60m
Detection Object	Minimum detectable width at 10m : 130mm (Vary with distance)
Accuracy	Under 3000lx : White Kent Sheet: $\pm 30\text{mm}^{*1}$ (0.1m to 10m) Under 100000lx : White Kent Sheet: $\pm 50\text{mm}^{*1}$ (0.1m to 10m)
Measurement Resolution	1mm

Repeated Accuracy	0.1 – 10m : $\sigma < 10\text{mm}$ 10 – 30m : $\sigma < 30\text{mm}$ (White Kent Sheet) Under 3000lx : $\sigma = 10\text{mm}$ (White Kent Sheet up to 10m) Under 100000lx : $\sigma = 30\text{mm}$ (White Kent Sheet up to 10m)
Scan Angle	270°
Angular Resolution	0.25° (360°/1440)
Scan Speed	25ms (Motor speed : 2400rpm)

Tab. 1 Parameters of laser rangefinder Hokuyo UTM-30LX given by the manufacturer [2].

4 Experimentally determined parameters of sensor model

Based on data gathered from the measurement (Fig. 2) , the Gaussian sensor model was chosen as the most suitable probabilistic model for our sensor[3].

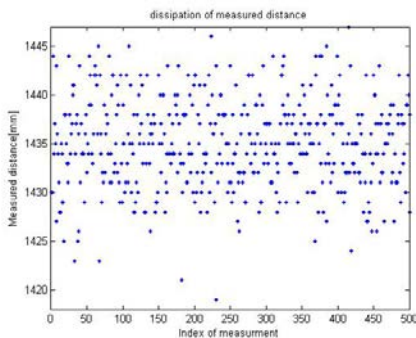


Fig. 2 Example of data set measurement which where used in the probabilistic model.

The probability distribution of measured distances in the Gaussian model equal to:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \tag{4}$$

where σ is the standard deviation and μ is the average distance of measurements.

For each surface, listed in the previous section, 20 experiments of 500 measurements of a selected distance were carried out. Measurements were conducted perpendicularly to the surface or at an angle of 45°.

1. *Cardboard box* - was characterized by the most stable measurement. In perpendicular measurements (Fig. 3 left) the standard deviation was $\sigma = 4,6533\text{mm}$. The measurements at an angle of 45° (Fig. 3 right) showed significantly lower quality with a standard deviation of $\sigma = 5,9321\text{mm}$.

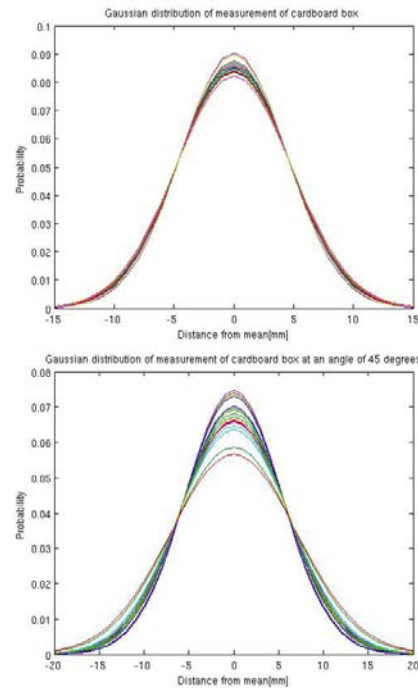


Fig. 3 The Gaussian distribution of distance measurement of cardboard box perpendicular to the surface (left) at an angle of 45° (right) .

2. *Plastic wicker surface* - Plastic wicker surface - for the distance measured perpendicular to that surface (Fig. 4 left) characteristics of measurements were similar to those of the cardboard box. The standard deviation was equal to $\sigma = 4,9129\text{mm}$. As for the measuring this surface at an angle of 45° (Fig. 4 right) the heterogeneous structure of the surface was shown significantly. Thus the repeatability of the measurement was worsened as well. The standard deviation for this measurement was equal to $\sigma = 5,6927\text{mm}$.

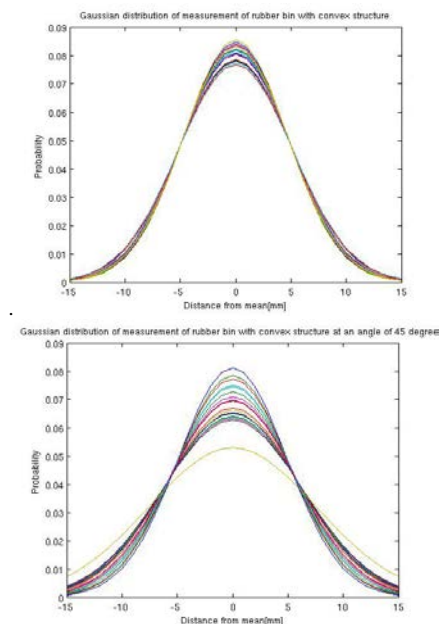


Fig. 4 The Gaussian distribution of distance measurement of plastic wicker surface perpendicular to the surface (left) at an angle of 45° (right).

3. *Fabric* - for the measurement of the fabric surface in the perpendicular direction (Fig. 5 left) the standard deviation was $\sigma = 4,9352$ mm. This surface shows a small variance of values. By the measurements at an angle of 45° (Fig. 5 right) large fluctuations between individual measurements emerged in the data set. The standard deviation of this measurement was $\sigma = 6,1049$.

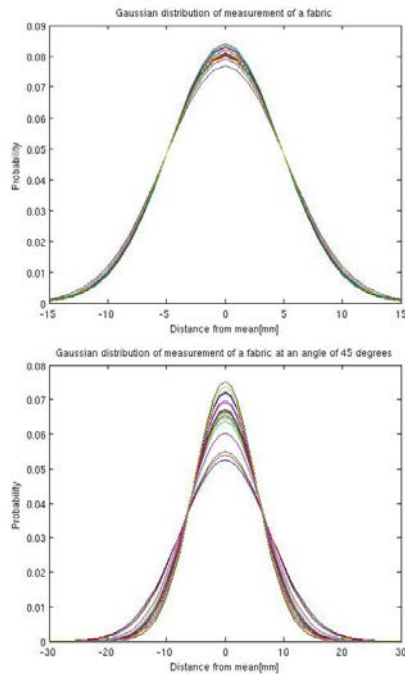


Fig. 5 The Gaussian distribution of distance measurement of fabric perpendicular to the surface (left) at an angle of 45° (right).

4. *White paper* - for the measurements of this surface in the perpendicular direction (Fig. 6 left) the standard deviation of $\sigma = 5,3914$ mm has the highest value of all surfaces. Similarly, for the measurements at an angle of 45° (Fig. 6 right) white paper is the surface showing the worst measurement repeatability. The value of the standard deviation for these measurements was $\sigma = 6,2753$ mm.

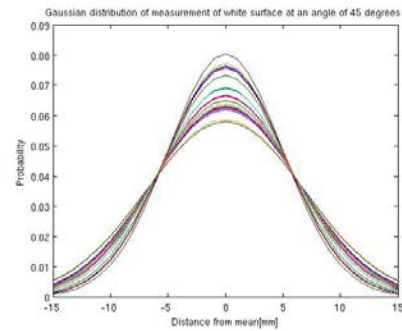
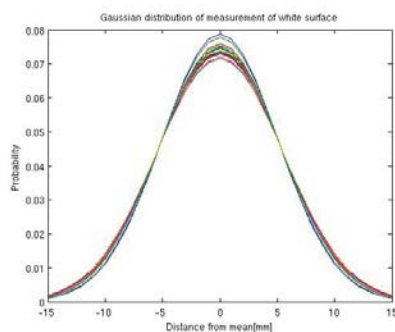


Fig. 6 The Gaussian distribution of distance measurement of white paper perpendicular to the surface (left) at an angle of 45° (right).

5. *White shiny surface* - White shiny surface - this type of surface belonged to the surfaces with the worst measurement repeatability for the measurements in the perpendicular direction (Fig. 7 left), similarly to the white paper. The standard deviation for these measurements was $\sigma = 5,0832$ mm. The standard deviation for the measurements at an angle of 45° (Fig. 7 right) was $\sigma = 5,8775$ mm.

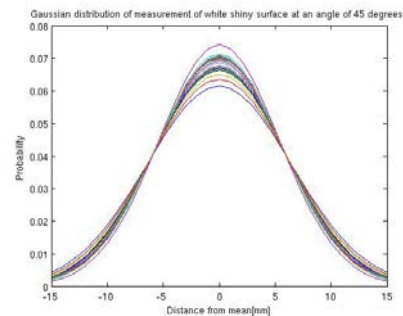
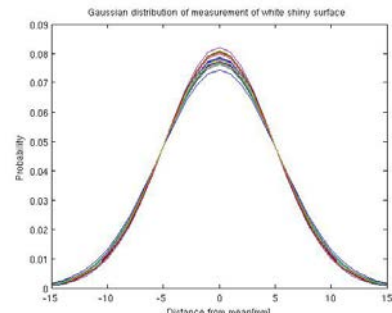


Fig. 7 The Gaussian distribution of distance measurement of white shiny surface perpendicular to the surface (left) at an angle of 45° (right).

6. *Shiny black metal* - Shiny black metal - the perpendicular measurements of the black shiny metal surface (Fig. 8 left) were the measurements with one of the highest repeatability. Standard deviation was $\sigma = 4,7402$ mm. For the measurements at an angle of 45° (Fig. 8 right), the surface showed a mirror reflection of signals transmitted by the sensor, and therefore the standard deviation had a value of $\sigma = 8,6743$ mm.

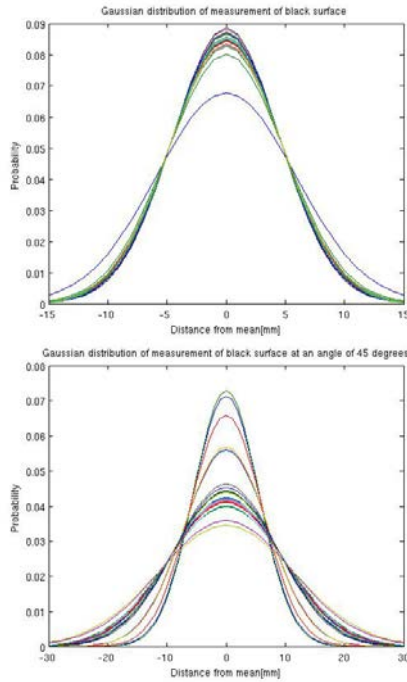


Fig. 8 The Gaussian distribution of distance measurement of shiny black metal surface perpendicular to the surface (left) at an angle of 45° (right).

Type of the surface	Perpendicular measurement	Measurement at an angle of 45°
Cardboard box	4,6533 mm	5,9321 mm
Plastic wicker surface	4,9129 mm	5,6927 mm
Fabric	4,9352 mm	6,1049 mm
White paper	5,3914 mm	6,2753 mm
White shiny surface	5,0832 mm	5,8775 mm
Shiny black metal	4,7402 mm	8,6743 mm

Tab. 2 Comparison of all standard deviations for all measurements. The highest values of the various types of measurements are highlighted in red, the lowest in blue.

In the third type of experiments the cardboard box was used because of the best results for perpendicular measurements. The measurement was aimed at the consistency of data around the edges of obstacles, i.e. the determination of the position of an obstacle within the measured data set (Fig. 9). The measurement was taken for four distances - 50 cm, 150 cm, 250 cm and 530 cm. For each distance, measurements were performed 10 times with 500 measured distances per data set. The measurement result is the number of shifts of the object for its left and right edge. The results are shown in the table (Table 3).

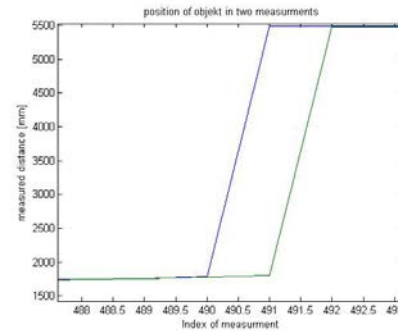


Fig. 9 Example of the position of the object boundary shift between the two measurements.

Measured distance / Number of measureme	1	2	3	4	5	6	7	8	9	10
50 cm	161	246	197	220	180	190	146	108	136	248
150 cm	191	27	105	211	85	90	60	31	180	33
250 cm	44	43	48	38	160	74	39	5	142	18
530 cm	5	32	34	0	42	74	14	2	1	0

Tab. 3 Number of the boundary shifts of the object at the corresponding measured distances from the total number of 500 measurements.

The Gaussian distribution was determined for the given measurement set (Fig. 10). As can be seen, with increasing distance the shift of boundaries of an object tends to decrease. This is due to the wider dispersion of the transmitted rays.

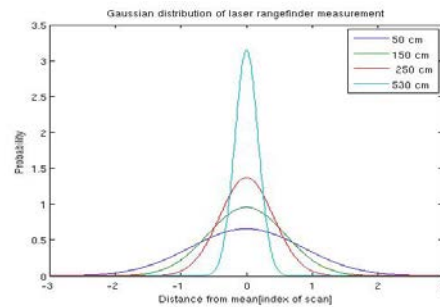


Fig. 10 Gaussian distribution of distance measurements to a cardboard box for object boundaries shift.

Based on the Gaussian distribution and the measured distances it is possible to determine the shift of the object border on the basis of angular distances between two beams of the laser range finder (Table 4) according to:

$$y = 3 \cdot \sigma \cdot \sin(d) \cdot dst, \tag{5}$$

Measured distance	σ [mm]	y [mm]
50 cm	0,6078	3,9783
150 cm	0,4160	8,1677
250 cm	0,2907	9,5131
530 cm	0,1269	8,8020

Tab. 4 Standard deviation of Gaussian distributions for various measured distances and their corresponding distances for the boundaries shift of the object.

5 Sensor Model

The complete sensor model is composed of two partial models derived in Chapter 4. The laser rangefinder Hokuyo UTM-30LX is a planar rangefinder (i.e. measures distances in the plane), and therefore it must be interpreted, as well as its measurement, in the plane. As the partial model in the direction of the measured distance, we used the model derived by measuring the distances to objects (first and second test or type of measurement). In this case, the Gaussian distribution with the average of standard deviations of all types of measurements was chosen. Its value is equal to $\sigma = 5,6894$ mm. The resulting Gaussian distribution is shown in Fig. 11.

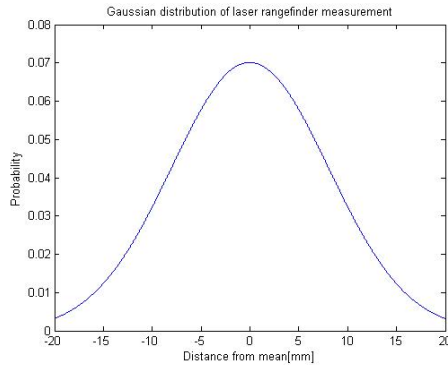


Fig. 11 The final Gaussian distribution model for the Hokuyo UTM LX-30 sensor in the direction of a measured distance.

As the model in the direction perpendicular to the direction of distance measurements, the model derived from the shift of object boundaries was chosen. The resulting standard deviation for the Gaussian distribution in this direction was $\sigma = 3$ mm. The resulting distribution can be seen in Fig. 12.

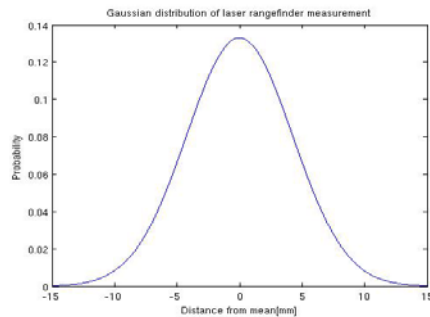


Fig. 12 The final Gaussian distribution model for the Hokuyo UTM LX-30 sensor in a direction perpendicular to the measured distance.

Based on these two resultant Gaussian distribution the resulting model of laser range finder has been created (Fig. 12):

$$f(x, y) = \frac{1}{2\pi\sqrt{\sigma_x^2\sigma_y^2}} e^{-\left(\frac{(x-\mu_x)^2}{2\sigma_x^2} + \frac{(y-\mu_y)^2}{2\sigma_y^2}\right)}, \quad (6)$$

where x is the corresponding measured distance, the σ_x is standard deviation of the Gaussian distribution in the direction of the measured distance, y is the corresponding dispersion distance in a direction perpendicular to the measured distance (see Table 4. and the formula 5) and σ_y is the standard deviation of the Gaussian distribution in the direction perpendicular to the measured distance.

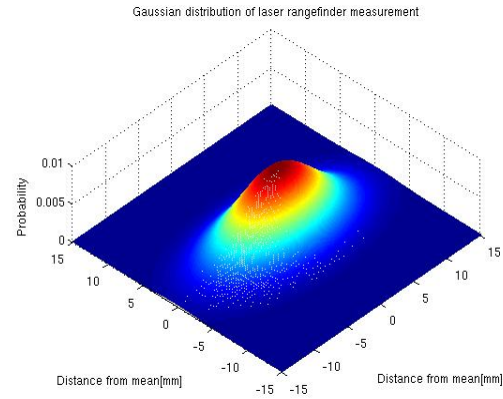


Fig. 13 The resulting planar Gaussian model of the laser rangefinder Hokuyo UTM-30LX sensor.

For the purposes of mobile robotics, such as area mapping, the model of laser rangefinder can be specified in tabular form, or grid. For a selected raster of 5x5 mm (i.e. the size of a cell in metric maps is 5 mm) and for the derived sensor model, such a table is:

0,0124	0,1629	0,0124
0,0414	0,5416	0,0414
0,0124	0,1629	0,0124

Tab. 5 Example of a tabular representation of the sensor model.

The application of the sensor model can be explained on a simple example. Let the measured distance be 200 mm. Let us say that the beam, that measured this distance, was sent at an angle of 0° . Then in the environment map, for the position $x = 40, y = 0$, the probability that the cell is occupied will have a value equal to 0,5416, the neighboring cell at the position $x = 41, y = 0$ will have the value of probability of occupation 0,1629 etc.

6 Conclusion

The proposed probabilistic model can be used on various areas of practice. At the workplace URPI FEI STU it is used primarily for mobile robot control. Mobile robots perform foremost tasks of localization and navigation. Since most of the available sensors are inaccurate, it is necessary to use information fusion from different sensors. For this it is necessary to have a good sensor model. The proposed model can be used in localization (e.g. Markov or using the Kalman filter) as well as for navigation (e.g. the creation of a probabilistic representation of the grid environment) of a mobile robot.

Literature:

1. Siegwart, R., Nourbakhsh, I.R. *Introduction to Autonomous Mobile Robots*. Massachusetts Institute of Technology, 2004. 336p. ISBN-13 978-0-262-19502-7.
2. *Scanning Laser Range Finder UTM-30LX/LN Specification*. Available at: http://www.hokuyo-aut.jp/02sensor/07scanner/download/data/UTM-30LX_spec.pdf
3. Greš, J., Kelemen, M.: *Model of biologically inspired robot Spinner*. Strojárstvo 1/2007, p. 72-73. ISSN 1335-2938.

Primary Paper Section: J

Secondary Paper Section: JB,JD

UTILIZATION OF WASTE MATERIALS IN THE DEVELOPMENT OF LIGHT CONCRETE FOR HIGH TEMPERATURE

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Abstract: This article is dedicated to possibilities of use of aerated concrete as an insulating material for higher temperatures. Today, there has been strong effort to push the price down and to make the building cost more effective. It is important to look for savings within operations along heat installations. This is possible by use of the right type of insulating material.

Keywords: Insulating material, high temperature, waste materials

1 Introduction

The cornerstone of any successful business is a continuous effort to improve things around. Production must be made more and more effective, it must be always improved on and on and developed further. A common question is about where we shall go so that the quality of resulting products cannot be reduced. As the first line, it is the best way to be done to remove sources of unnecessary losses, among which we may include losses of heat. Huge problem lies in the losses of high-temperature devices such as furnaces, ducts, chimneys, etc. There is a huge amount of energy leaking through walls of these high-temperature equipments, this energy could be saved by using the appropriate insulation. However, such insulation must be resistant against high temperatures. All currently manufactured insulation materials which are resistant to high temperatures are not sufficiently flexible for insulation of structures with more complicated shape, or their production is very expensive too. It can be solved by material which is sufficiently flexible and heat resistant, the material made on silicate-base, the material which utilizes waste materials during its production.

2 Currently used materials

Technical equipment (e.g. chimneys, boilers, furnaces) have very specific requirements that must be taken into account during their insulating. We can find among them simple shapes of structures that can be insulated by using prefabricated boards or blocks. But also complicated shapes of structures whose surface cannot be easily covered by using simple shapes, so it is necessary to use material which will be produced directly on the site.

The most commonly used materials for the particular application at the present times undoubtedly include foam glass. Foam glass is resistant to water, humidity. Due to its closed structure, it does not leak water vapours. Furthermore, it resists to organic solvents, it is fireproof and resistant to high temperatures (500 °C). Among the other positives, we can also include dimensional stability and ecological safety. The disadvantage is the high production cost and hence the price.

Other suitable materials for use at higher temperatures, are mineral and glass wool, expanded perlite and insinglass. All these materials have excellent technological properties. However, their production is energetically complicated, which means a high financial cost. As the solution to this problem, we can see a design of new material that will benefit from low-cost modern technology while maintaining the desired properties.

3 Choosing of waste raw materials

It exists a huge amount of waste materials. Theirs utilization should reduce environmental deterioration, but not all waste products are usable in specific condition of use.

The new material must fulfill requirement of thermal resistance, to prevent failure by elevating temperatures. Thank this need is for the classification of secondary raw materials the first criterion clear. Next condition, which should be satisfied by the new insulating material, is suitability of use in combination with the silicate binder.

Among materials, which are fulfilling these two basic requirements, belongs concrete waste, mixed construction waste, aerated concrete, ceramic waste, bricks, roof tiles, sand-lime brick, glass wool, mineral wool, waste sand, waste stone, waste dust exhaust, gas boiler dust, slag, waste soot, ash, dross, scrap metal, waste glass, waste glass containing pollutants, keramzite-concrete, slag-concrete, dross-concrete, agglomerite-concrete, perlite-concrete and ceramic brick-concrete.

The optimization analysis helps us to understand better the suitability of secondary raw materials for this application by comparing thermal and technical characteristics of these waste materials.

The output of the optimization analysis (using the pair comparison criteria) can be clearly expressed by the following chart.

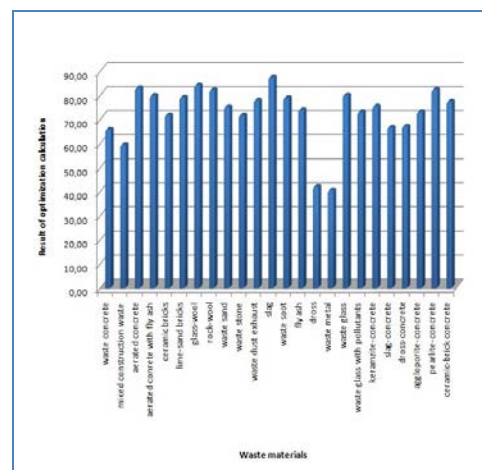


Fig. 2: Evaluation of optimization analysis

Comparison of thermal and technical characteristics indicate, that the most appropriate secondary materials are slag, glass-wool, aerated autoclaved concrete, waste perlite-concrete, rock-wool, glass waste, aerated autoclaved concrete with fly ash, sand-lime brick waste, carbon black, boiler dust ceramic brick-concrete, keramzite-concrete, waste sand, fly ash, agglomerite-concrete. But not all of these waste materials could be used as a filler for new insulating system. It is necessary to review their benefits, the economic performance of the elimination of their conditionally applicability and quantities of waste appearance.

4 Increasing of thermal resistance

The main purpose of the proposed material is thermal insulation resistance of existing constructions with high temperature. The largest consumer of thermal energy (from a group of construction for which is the material intended) is industrial furnace.

Increasing of the specific thermal resistance is shown at the simplified example of heat transfer through external cladding of model furnace with fireclay lining with thickness of 0.10 m and with sheathing with thickness of 0.40 m. The design temperature inside the furnace is about 1000 °C.

When are these materials with high coefficient of thermal transmission used, there is enormous heat loss, which could be eliminated by adding of suitable insulation.

For example, after adding of designed thermal insulation with thickness of 0.15 m, is the temperature distribution in the construction changed consequently:

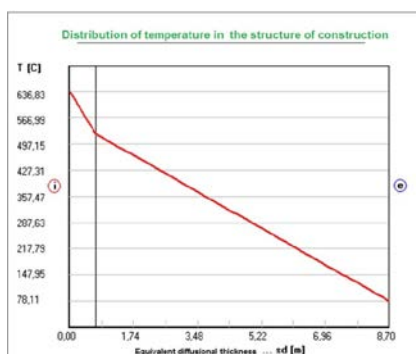


Fig. 3: Distribution of temperatures before adding of insulating material

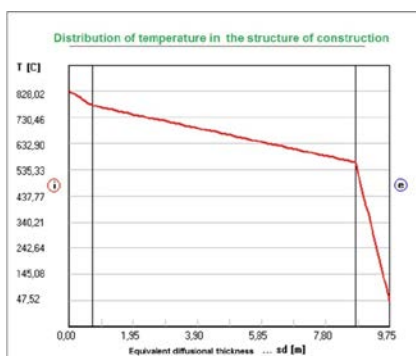


Fig.4: Distribution of temperatures after adding of insulating material

In keeping the supplied heat in the furnace chamber, temperature will increase by adding extra insulation on internal surface of the construction to about 200 °C.

Tab.1: Simulated specific thermal resistance and coefficient of thermal transmission according to ČSN EN ISO 6946

	sign	unit	actual state	with added insulation
Specific thermal resistance	R	m ² K/W	0,38	1,13
Coefficient of thermal transmission	U	W/m ² K	1,80	0,77

Adding of extra insulation will significantly reduce the coefficient of thermal transmission and closely related increase of specific thermal resistance. The increase of specific thermal resistance of the construction will reduce the cost of delivered heat energy into burning space.

5 Conclusion

This article outlines the possible use of aerated concrete for the purpose of insulating thermally-sophisticated equipments. The material should combine some of the advantages of currently produced aerated concretes and foam concretes (low volume weight, high heat resistance, low production costs) with high heat resistance. The benefit of this new material is its ability to perform its function even at higher temperatures. By creating a substance based on silicate which is filled with waste materials with improved thermal resistance and by its subsequent aeration,

we will obtain a material capable of resistance to high temperatures (up to 500 °C) and having sufficient heat resistance; the material whose production is less expensive compared with other insulating materials of comparable properties.

Possibilities of its production, application and use are still at an early stage of development. The article only provides the alternative possibilities of using the porous material based on silicate as a thermal insulator with higher thermal resistance.

Literature:

1. Drochytka, R.; Zach, J.; Hroudová, J. *Problematika stanovení návrhových tepelných hodnot u pórobetonového zdiva*. In Conference - Testing and Quality in the Building Industry Brno: VUT, Brno, 2010. page 279-287. ISBN: 978-80-214-4144 - 6
2. Svoboda, L., *Stavební hmoty*. Bratislava: JAGA GROUP, s.r.o., 2007, ISBN 978-80-8076-057-1
3. Šťastník, S.; Bradáč, O.; Kminová, H.; Zach, J. *Netradiční použití silikátových pojiv pro přípravu tepelně izolačních materiálů*. In Maltoviny 2003, 2nd Conference of Experts Brno: FAST VUT Brno, 2003. page 81-85. ISBN: 80-86607-08-9.
4. Výborný, J., Košťatka, P., Drochytka, R., Pume, D.: *Aerated Concrete*, 1st Edition Brno: VUTIUM Press, 2000. page 156. ISBN 80-214-1476
5. Catalogue of wastes, supplement No.1 of decree of the government ČR MŽP 381/2001 Sb.

Primary Paper Section: J

Secondary Paper Section: JI, JJ, JN

MELT FLOW BEHAVIOUR OF COMPOSITE MATERIALS WITH NATURAL ANIMAL FILLERS

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Abstract: This paper is focused on the evaluation of flow behaviour of bio-composite materials. For this article was chosen composite with polypropylene matrix in which are natural animal fillers dispersed. The research that includes creating new materials and modifying existing ones is based on demand of using materials from renewable sources. Technical university of Liberec cooperates on long-term development of "green materials" consist of polymeric matrix and natural fibres. The basic research is focused on determination of mechanical and physical properties and processability of bio-composites and their affecting by chemical coupling agents. Except the standardised tests these materials were inspected with using of SEM microscopy to find out the influence of polymeric matrix origin, shape and size of particles and coupling agents presence on behaviour of final bio-composites.

Keywords: rheology, polymeric matrix, natural animal fibers, bio-composites

1 Introduction

Nowadays the plastic processing technologies and new approaches in chemical modification enable using of new materials. This is the best time for creating bio-composites that could replace usually used polymers. There are two ways how to achieve that. "Green materials" involves certain volume of particles of natural origin and the base (the matrix) can be of synthetics origin. The second possibility is biodegradable polymeric matrix reinforced by natural fibres that brings totally ecological composite from renewable sources. This research is basically focused on creating of new materials for automotive industry, namely for interiors parts but actually depending on used polymer matrix these materials will have very wide range of applications. Branch of "green materials" is very extensive and the issue of incorporation natural fibres into polymeric matrix is very complex and that is why only the rheology is mentioned in this paper.

Deformation and flow behaviour under various conditions (different temperature and pressure) is studied by the rheology [1], [2], [3]. This branch of science works with fluid and solid mechanics. Deformation behaviour of ideal solid is described by the Hooke's law. The applied stress is proportional to the resultant strain but is independent of the rate of this strain. When the stress is removed, the body gets the original shape again and

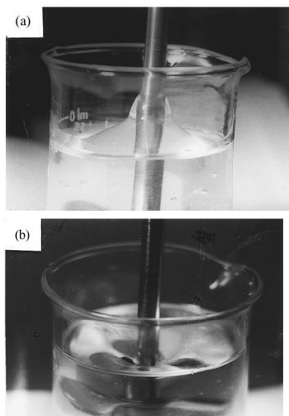


Fig.1. Different rotation behaviour between
 (a) viscoelastic fluid and (b) Newtonian fluid [2]

accumulated deformation energy is released. The ideal behaviour of liquids is described by Newton's law [4], [5]. The viscosity is defined as equivalent to the force needed to affect the flow of a fluid. Deformation behaviour of polymeric materials goes from combination of the viscosity of a liquid and the elasticity of a solid state. Properties of polymers are depend on surrounding occupation (temperature, pressure etc.) and get near to one or the other ideal state and that is why this

materials are classify among viscoelastics (Fig. 1) [2], [6]. A lot of rheological models were created for description of complicated viscoelastic behaviour [7] but generally we can say that when small deformations are caused than the behaviour is liner and when bigger deformations are used than the behaviour is non-linear. Flow properties of polymeric materials can be observed in the state of melt (Non-Newtonian flow behaviour) or in the solid state (creep, stress relaxation etc.) [8]. Furthermore we will deal only with polymers in state of melt. The final melt behaviour is given by the molecular weight, chain branching, and molecular distributions and is also affected by used fillers [9].

2 Materials and methods

2.1 Fillers shape and size

Various components are added to the polymeric matrix to reach required properties of the material. In the literature we can find two main groups of fillers. The first group involves composites materials known as "filled materials". The volume fraction of the matrix is usually more than 50% and it is filled with some particles (talc, mica, clay etc.) [6], [10]. The shape of these particles affects all final composite properties (mechanical, rheological, physical etc.) [11]. The second group of composite materials is called "reinforced materials". These composites are filled by short or long fibres (glass fibres, boron fibres, organic fibres, carbon fibres etc.) and volume of the matrix is usually less than 50% [6], [10]. Fillers can achieve different orientation depending on their shape, size and processing conditions. Each fillers formation make possible different mechanical properties.[12] What is rheology concerned, the shape, the size and the concentration of fillers have the most important effect on melt flow properties of filled materials. Viscosity increases with decreasing filler size, increasing surface area of fillers and increasing filler concentration [9].

2.2 Matrix impact

Fillers (especially reinforced additives) should be combined with suitable matrix for taking several advantages. The most important functions of the matrix are to keep the fillers in the structure, to protect the fillers in the structure and during fabrication and also to help to transfer the load. [13]. There are a lot of different matrixes (metal, ceramic etc.) on the market but we will deal with the thermoplastics matrix. Semicrystalline thermoplasts are more efficient reinforced than amorphous thermoplasts are. In the plastic state the fillers act as nucleation sites for polymer crystallization (semicrystalline thermoplasts) and enhance the polymer crystallinity. Higher crystallinity is associated with a higher level of fibre-matrix interaction [14], [15].

2.3 Determination of melt flow index

Technological tests for determination of polymer flow behaviour are carried out on two types of instruments. Rotational viscometers are used for measurement of viscosity when small shear rate is used and capillary viscometers are more appropriate when lower viscosity with higher shear rate is measured [16]. The precise method of this test and used instruments are given by the ISO standard. Melt flow index is presented as the amount of the melt in cubic centimetre (Melt Volume Rate) or in grams (Melt Flow Rate) per 10 minutes. For each material the test conditions are then specified (especially temperature and load). This way of determination of polymer flow properties is not universal for all polymeric materials. That is suitable only for thermoplastics whose rheological behaviour is not affected by hydrolysis or netting structure effect when increased temperatures are used [17]. The test results may predict molecular weight of thermoplastic macromolecules that directly influences the melt flow behaviour. Polymers with higher molecular weight reach better mechanical properties in solid

state (higher strength, stiffness, lower tenacity) and higher viscosity [5].

3 Experiment procedure

3.1 Material specification

For the experiment was synthetic matrix chosen. Pure polyacrylonitrile-butadiene-styrene has low melt flow properties due to its high molecular weight and belongs to amorphous thermoplastics. Its chemical structure makes it strength, tough with low tenacity and that is why this material is used for construction applications. Its biggest

disadvantage is quite high hygroscopic properties what is caused by polar bonds. When ABS absorbs moisture then its insulating properties are reduced.

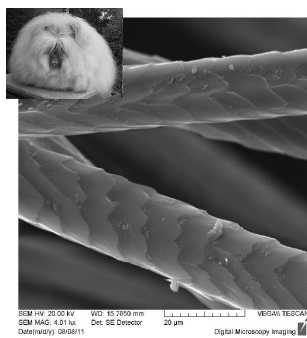


Fig.3. Picture of Angora rabbit fibres taken by SEM microscopy (animal picture [20])

3.2 Compound production

Pellets of polymeric compound were produced by two screw extruder. Its construction includes two dosing areas and feeders (one for pure polypropylene matrix and the other for fibres). The screws have special design that includes two mixing zones for processing of natural fibres.

3.3 Melt flow index measurement

Determination of melt flow properties were carried out on the capillary viscometer in laboratories of Technical university of Liberec. The work area of the viscometer was heated on temperature of 180°C and the piston was weight by 2,16 kg. When the work area of viscometer was sufficiently warmed through, pellets of created compound were put into the viscometer cylinder were compressed by the compacting rod. Before test start the piston was put into cylinder on pellets. This filling proceeding must be performed until one minute [17] and after that the test can be launched. Initially the

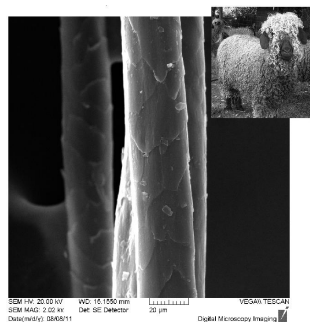


Fig.2. Picture of Angora goat fibres taken by SEM microscopy (animal picture [19])

This polymer (with trade mark Magnum) is resistant to concentrate acids and alkalis [18]. As reinforced fillers hair of lama alpaca, camel, angora goat (mohair) and angora rabbit were chosen. In fig. 2, 3, 4, 5 the pictures taken by SEM microscopy are shown. The differences among surfaces of individual fibres and their diameters are noticeable.

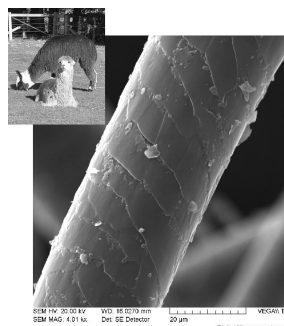


Fig.4. Picture of lama Alpaca fibres taken by SEM microscopy (animal picture [22])

pellets are preheated 4 minutes and then the load is put on the piston. The base principle of measurement is monitoring of piston velocity by the extensometer inside precisely given area of the cylinder. The results of the measurement are included in Table I.

4 RESULTS AND DISCUSSION

Table I: Melt Flow Index of ABS Matrix with Chosen Natural Animal Fillers

Material description	ISO 1133
	MVR (180°C/2,16 kg) [cm ³ /10 min]
ABS	4,1
ABS + 20 w.t.% of Angora goat fibres	6,2
ABS + 20 w.t.% of Angora rabbit fibres	7,3
ABS + 20 w.t.% of Camel fibres	27,9
ABS + 20 w.t.% of lama Alpaca fibres	4,6

The measurement results attest the theoretical foundations that reinforced fillers significantly affect the flow properties of polymer melt [9], [11], [12]. Pure ABS has poor flow properties

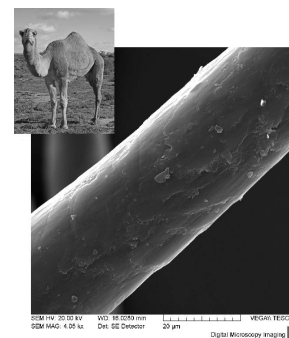


Fig.5. Picture of Camel fibres taken by SEM microscopy (animal picture [21])

at the temperature of 180 °C and all used fibres increase its melt flow index in spite of the assumption. Tested fibres have very similar chemical structure and are adapt in the same way (washing, drying and cutting without any other chemical modification). The length is the same for all studied fibres and their volume is 20w.t. % in the polymer matrix. The technological parameters for extrusion of compound material were also equal. All these facts

mean that differences among measured melt flow indexes are caused by different shape and surface of the fillers only. Photos taken by SEM microscopy can help us to decide what has bigger impact on the melt flow behaviour if the shape profile or the size (average fibres diameter). Three types of fibres have approximately the same average diameter of 30 µm (Angora goat, Camel and lama Alpaca fibres) and so the differences of individual MVR are caused by their shape profile. The smoothest one can be seen in the Fig 5 and camel fibres also obtained the lowest viscosity (the highest melt volume rate). All the others fibres have more or less rugged surface profile. The second best result was achieved by Angora rabbit fibres because of their small average diameter. Angora goat fibres and lama Alpaca fibres look very similar and also reached similar results. They have approximately equal average diameter but the surface structure looks a little bit smoother in the case of Angora goat fibres and that is why these fibres reached better MVR. From the measured values the fact follows that influence of fibre surface has higher impact on the final flow behaviour than the factor of fibre size. The research of "green and eco-friendly materials" is very beneficial and brings new materials that are suitable for a lot of applications. Our main goal is to find new formulas of polymer compounds that will have the mechanical and physical properties very similar to pure polymer matrix and reduce the consumption of synthetic polymer in the world. Next great advantage is the price reduction of these new compounds. The concentration of 20w.t. % natural animal fibres leads to decrease the price by approximately 24 %.

Literature:

1. CARRAHER, Charles E. Seymour/Carraher's *Polymer Chemistry*. 7th edition. Florida : CRC Press, 2008. Rheology and physical tests, pp. 459-465. ISBN 978-1-4200-5102-5, ISBN 1-4200-5102-4.
2. HAN, Chang De. *Rheology and processing of polymeric materials : Polymer rheology*. vol. 1. Oxford : CRC Oxford university press, 2007. Relationship between polymer rheology and polymer processing, pp. 3-10. ISBN 978-0-19-518782-3.
3. ROSATO, Dominic V.; ROSATO, Donald V.; ROSATO, Marlene G. *Injection molding handbook*. 3rd edition. Boston : Kluwer Academic Publisher, 2000. Rheology and melt flow, pp. 530-536. ISBN 0-7923-8619-1.
4. CRAWFORD, Roy J. *Plastics engineering*. 3rd edition. London : Butterworth Heinemann, 2002. Analysis of polymer melts, pp. 343-346. ISBN 0-7506-3764-1.
5. VAN DER VEGT, A.K. *From polymers to plastics*. Delft : Delft university press/Heinemann, 2006. Viscosity, pp.103-112. ISBN 978-90-71301-62-9.
6. VASILIEV, Valery V.; MOROZOV, Evgeny V. *Mechanics and analysis of composite materials*. Amsterdam : Elsevier, 2001. Time and time-dependent loading effects, pp. 1,319-332,365. ISBN 0-08-042702-2.
7. BARNES, Howard A.; HUTTON, John F.; WALTERS, Kenneth. *An introduction to rheology*. 3rd edition. London : Elsevier, 1993. Linera viscoelasticity, pp. 37-46. ISBN 0444871403.
8. HUILQOL, R.R.; PHAN-THIEN, N. *Fluid Mechanics of viscoelasticity : Volume 6: General Principles, Constitutive Modelling, Analytical and Numerical Techniques (Rheology Series)*. 1st edition. Amsterdam : Elsevier, 1997. Viscometric flows, pp. 40-47. ISBN 0-444-82661-9.
9. HORNSBY, P. R. *Rheology, Compounding and Processing of Filled Thermoplastics*. In JANCAR, J. Mineral Fillers in Thermoplastics I : Raw materials and processing. 1st edition. Berlin : Springer, 1999. pp. 155-217. ISBN 978-3-540-6421-1.
10. KUMAR, Anil; GUPTA, Rakesh K. *Fundamentals of polymer engineering*. 2nd edition. New York : Marcel Dekker, 2003. Step-Growth Polymerization, pp. 103-107. ISBN 0-8247-0867-9.
11. ROTHON, Roger N. ; HANCOCK, Michael . *General principles guiding selection and use of particulate materials*. In ROTHON, Roger N. Particulate-filled polymer composites. 2nd edition. UK : Rapra technology limited, 2003. pp. 17-19. ISBN 1-85957-382-7.
12. CAIN, Rebecca; PINFOLD, Martyn K.; LINDSEY, Kevin A. General Properties of Composites : Stiffness, Strength and Toughness. In TUCKER, Nick; LINDSEY, Kevin. *An introduction to automotive composites*. 1st edition. UK : Rapra technology limited, 2002. pp. 59-61. ISBN 1-85957-279-0.
13. BERGLUND, Lars A. Polymeric matrix system : Thermoplastics resins. In PETERS, S.T. *Handbook of composites*. 2nd edition. London : Chapman & Hall, 1998. pp. 115-131. ISBN 0-412-54020-7.
14. CHUNG, Deborah D. L. *Carbon fiber composites*. 2nd edition. Massachusetts : Butterworth Heinemann, 1994. Polymer matrix composites, pp. 85-102. ISBN 0-7506-9169-7.
15. SAIELLO, S.; KENNY, J.; NICOLAIS, L. Interface morphology of carbon fibre/PEEK composites. *Journal of materials science*. 1990, 25, pp. 3496-3496. ISSN 1573-4803.
16. SCHRAMM, Gebhard. *A practical approach to rheology and rheometry*. 2nd edition. Germany : Thermo electro (Karlsruhe), 2004. Types of rheometers/viscosimeters, pp. 28-73. ASIN B000BWWY1WA.
17. ISO 1133:2005. *Plastics -- Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*. Prague : Czech Standards Institute, 2005. 15 p.
18. BRYDSON, J. A. *Plastics materials*. 7th edition. Oxford : Butterworth Heinemann, 1999. Plastics based on styrene, pp. 434-447. ISBN 0-7506-4132-0.
19. Wikipedia : *The free encyclopedia* [online]. 2011-08-28 [cit. 2011-08-22]. Mohair. Accessible WWW: <<http://en.wikipedia.org/wiki/Mohair>>.
20. Wikipedia : *The free encyclopedia* [online]. 2011-08-21 [cit. 2011-08-22]. Angora rabbit. Accessible WWW: <http://en.wikipedia.org/wiki/Angora_rabbit>.
21. Wikipedia : *The free encyclopedia* [online]. 2011-08-31 [cit. 2011-08-22]. Camel. Accessible WWW: <<http://en.wikipedia.org/wiki/Camel>>.
22. Wikipedia : *The free encyclopedia* [online]. 2011-06-11 [cit. 2011-08-22]. Lama Alpaca. Accessible WWW: <<http://en.wikipedia.org/wiki/Alpaca>>.

Primary Paper Section: J**Secondary Paper Section: JI, JP**

WARM MIX ASPHALT WITH FT ADDITIVE – RESULTS OF LABORATORY TESTS

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Abstract: Modern production and use technologies of asphalt mixtures using lower temperatures have many advantages. These advantages are mainly of ecological and energy saving matters. Lower temperatures enable reduction of energy consumption, more acceptable working environment for workers, reduction of negative environmental effects – greenhouse gas emissions, improvement in workability of mixtures and prolongation of working period with them. This technology is currently becoming popular in many countries. This article is focused on low-temperature technologies of asphalt mixtures using FT additive.

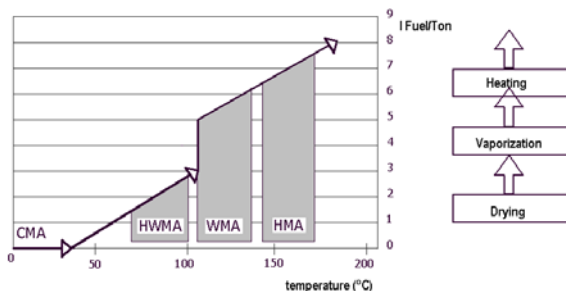
Keywords: warm mix asphalt (WMA), low-viscosity additive, asphalt binder, laboratory tests.

1 Warm mix asphalt

This technologie was first mentioned in Europe in 1995. In the year 2002 by the initiative of NAPA (National Asphalt Pavement Association) testing of these mixtures started in Europe, in the USA the practical testing was underdone under the supervision of technical working group established by US Ministry of Transport and NAPA. National Center for Asphalt Technology and various Universities were participated on this research. Consequently, as continuation, AASHTO (American Association of State Highway and Transportation Officials) and US Ministry of Transport moved the research to Europe. First public display was in the USA in 2004. In 2007, team of 13 American researchers has visited 4 European countries (Belgium, France, Germany and Norway) to collect theoretical and practical knowledge on this matter. Nowadays, warm asphalt mixtures are used in many countries all over the world such as China, Denmark, Italy, Malaysia, Russia, Sweden, Switzerland, South Africa, Great Britain and many others. [1], [2]

1.1 Advantages of WMA

As was mentioned before for the production of this type of asphalt mixtures is not necessary to have so high temperature as in the case of hot asphalt mixtures, which brings economical and ecological advantages. Picture No. 1 indicates connection between temperature and fuel amount needed for 1 tone of produced mixture and temperature scale for asphalt mixtures. Abbreviation HWMA (Half Warm Mix Asphalt) is used for transient asphalt mixture from cold mixtures CMA (Cold Mix Asphalt) to mixtures produced by higher temperatures WMA (Warm Mix Asphalt), abbreviation HMA (Hot Mix Asphalt) is used for mixtures produce by very hot temperatures. [1]



Pic.No.1 – Classification by temperature range, temperatures, and fuel usage are approximations

Main advantages:

- **Production and working temperatures** – with using various additives it is possible to reduce production and working temperatures on 20 to 55 °C. Temperature reduction offers the most satisfying conditions by mixtures laying and also for the workers.
- **Working conditions** – Regulation of the European Union REACH (Registration, Authorisation and Restriction of Chemicals) obliges every company to inform about and to register chemicals they use. Staff should have sound knowledge on chemicals they deal with and which can negatively impact their health. Asphalt binder is one of these chemicals. Reduction of production and working temperatures causes also reduces asphalt vapours - positive for working comfort. Measurement of evaporation, aerosols and polycyclic aromatic hydrocarbons in the production of warm mixtures shows lower values as in the production of hot mixtures, they are lower than limit values. Reduction is from 20 to 50 %.
- **Advantage by laying** – Between advantages connected with laying of asphalt mixtures can be included laying by lower temperatures still with required consistence, mixing time prolongation, use of larger amount of recycled material, possibility to compact the mixture by lower strength in standard conditions and prolongation of working season.
- **Amount of emissions** – Reduction of emissions depends on several factors (used aggregate, way of production, temperature reduction, used recycled material, aggregate moisture). On the basis of results from Belgium, France and Norway, with the use of warm mixtures comes reduction of production emissions. This reduction is closely connected to temperature. On the conference Bitumen forum was presented that by the temperatures under 80 °C no emissions are produced, by temperature 150 °C are emissions round 1 mg/h, more considerable amounts are produced only from 180 °C. Reduction of particular chemical compounds recognised from research: CO₂ (30 to 40 %), SO₂ (30 to 40 %), CO (10 to 30 %), (NO_x 60 to 70 %), volatile organic elements (50 %), dust elements (20 to 25 %).
- **Fuel saving** – fuel savings by WMA due to warming of the mixture is approximately on 11 to 35 % lower or can be also higher (to 50 %), this in the case of Low Energy asphalt or Low Energy asphalt concrete, where the aggregate is warmed to temperature below boiling point.

1.2 WMA Technologies

Selection of the technology depends on the temperature reduction and on the amount of the mixture which is aimed to be produced. Technologies of warm asphalt mixtures [1], [2] can be divided into technologies using:

- **Technologies using waxes and organic additives** – technology are based on viscosity reduction by wax warming above the melting point with the ensured mixing of mixture and by enabling the suitable laying. Melting point shall be higher than assumed service temperatures (permanent deformations) and shall minimize brittleness of asphalt by low temperatures. Waxes can increase the strength of asphalt; have lower penetration, higher resistance against high and low temperatures. Batching of wax depends on particular input materials of mixture and on road class where the mixture shall be used.
- **Addition of chemical additives and agents** – by use of chemical additives there is no change in viscosity of asphalt binder. In this technology ability of surface-active additives to thoroughly coat the aggregate with asphalt binder is utilized by lower temperatures. The additive reduces and regulates frictional force on the edge of binder and aggregate by temperatures between 140 °C and 85 °C. Temperature reduction necessary for production and compaction of asphalt will decrease on 20 °C to 30 °C depending of the type of additive.
- **Water addition** – technology is based on water addition to asphalt binder in the aim to foam it and by this to reduce the viscosity. The assumption is that added volume will change by

atmospheric pressure into steam, by which the volume of binder will increase and its viscosity will reduce during short time when the mixture is cooling. Consequently, the foaming will vanish and asphalt binder acts like binder without modification. Foaming of binder is done directly or indirectly. By direct foaming small amount of water is injected into warm asphalt binder by fuming jets to achieve temporal increase of binder volume. Reduction of temperature is between 20 °C to 30 °C. Indirect foaming is done by the use of synthetic zeolites or moist aggregate. Zeolit is crystallised hydrated alum-silicate containing approximately 20 % crystalic water released by temperatures over 100 °C. Such released water causes foaming of binder and during 6 to 7 hours, if the temperature does not decrease below 100 °C, shall ensure required workability of mixture. Reduction of temperature necessary for production and compaction of mixture is approximately 30 °C.

2 Experimental verifying of characteristics

Experimental part of this research was focused on laboratory verifying of asphalt mixtures characteristics determined for sub-base layers of pavement, asphalt mixtures where the asphalt binder is modified by FT additive. Concretely it is mixture AC 22 P; I, used additive was road asphalt 50/70 modified by FT additive Sasobit. Monitored was the influence of various amount of additive on binder characteristics and influence of additive on mixture resistance toward permanent deformations, resistance to fatigue and stiffness modulus of mixture.

2.1 Influence of additive on asphalt binder characteristics

Realised laboratory testing were softening point [5], breaking point [9], penetration [4] and force ductility [10]. In all tests was investigated dependence between increasing amount of FT additive (1, 2 and 3 %) and comparative value (50/70).

From the results of penetration test (0,1 mm) and softening point (Ring and Ball test) (°C) is evident positive influence of FT additive on these asphalt characteristics. With the increasing portion of Sasobit there was consistent decrease of penetration approximately on 25 %, from the value 61,6 (0,1mm) to 46,2 (0,1mm). In the case of asphalt binder resistance against high temperatures the value of softening point is increasing from 52 °C to 74 °C, which means increase on 22 °C. In the case of asphalt binder resistance against low temperatures the additive has hardly any influence, but also it has no negative influence on this characteristic. In all cases the value of breaking point (Fraass method) is round -11 °C. Basic tests results of asphalt binder are in table No. 1.

Characteristics of asphalt binder Tab.No.1

Binder	FT additive (%)	Penetration 25 °C (0,1 mm)	Softening point (°C)	Breaking point (°C)
50/70	0	61,6	52	-11
	1	52,6	57	-10
	2	49,6	63	-11
	3	46,2	74	-11

Force ductility test serves for strain strength determination of asphalt binder. On the basis of experience, the initial temperature 15 °C was selected. Testing specimens were in this test prolong to prescribed value 40 cm, in no case was the testing specimens trimmed. Resulting values of cohesive energy are in table No. 2.

Resulting values of force ductility, 15 °C Tab.No.2

FT additive (%)	15 °C				
	E _s (J)	E ₂₀ (J)	E ₄₀ (J)	E _r (J)	E ₂₀₋₄₀ (J)
0	0,133	0,803	0,932		0,122
1	0,102	1,596	1,878		0,281
2	0,142	1,862	2,129		0,267
3	0,163	2,251	2,792		0,541

2.2 Influence of additive on asphalt mixture characteristics

From the results of experimental verifying of interesting results came from resistance against permanent deformations and fatigue and determination of stiffness modulus.

2.2.1 Resistance against the permanent deformations

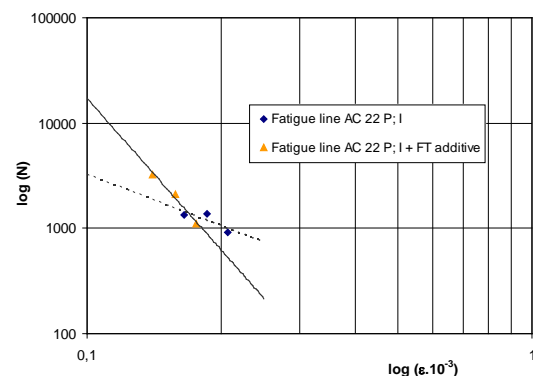
The resistance of asphalt mixture against the permanent deformation was determined with wheel tracking test, where the passage of vehicle on pavement is simulated. For this test was necessary to produce slab testing specimens. In the test was used small testing device and test was realised according correspondent standard, method B [6]. From the test were determined values of depth of tracked rut RD_{AIR} (mm), comparative depth of tracked rut PRD_{AIR} (%) and the slope of tracked rut WTS_{AIR} (mm/10³ loading cycles). First assumption was that after addition of FT additive there will be continuous increase or decrease of temperatures. In the case of depth of tracked rut of mixture AC 22 P; I is the course of values decreasing. In the comparison with reference mixture the values of RD_{AIR} are decreasing from 3,5 to 1,8 mm. The same course is also by values of relative depth of tracked rut PRD_{AIR} (%). Standard states its maximal value as 5 %. This condition was fulfilled by all mixtures except reference mixture with PRD_{AIR} = 5,6 %. In the case of slope of tracked rut the satisfactorily were only mixtures AC 22 P; I with 3 % FT additive with the value 0,07 mm/10³ loading cycles. According KLAZ [11] is maximal value for mixtures AC 22 P; I WTS_{AIR} = 0,10 mm/10³ loading cycles.

Resistance against the permanent deformations Tab.No.3

Mix	Binder	RD _{AIR} (mm)	PRD _{AIR} (mm)	WTS _{AIR} (mm/10 ³ l.c.)
AC 22 P	50/70	3,5	5,6	0,16
	50/70 + 1% FT	2,5	3,9	0,11
	50/70 + 2% FT	2,3	3,5	0,11
	50/70 + 3% FT	1,8	2,8	0,07

2.2.2 Resistance to fatigue

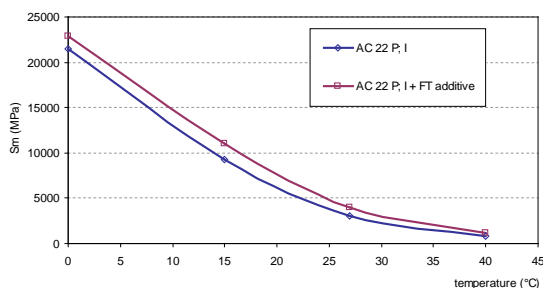
Fatigue can be defined as the loss of strength of asphalt mixture as result of repeated stress against the strength from single load. The test principle is in the repeated loading of test specimens by compression stress in the shape of sinusoids that causes the deformation [7]. This test was realised with the mixtures AC 22 P; I and AC 22 P; I + 3 % FT additive. Each mixture was subject of at least there levels of loading. From obtained values of loading impulses and developed vertical deformation were determined fatigue serviceabilities of mixture. Calculates values of horizontal tensile deformation served for drawing the fatigue envelopes and for determination of regression equations from which where material constants k and n determined. From the development of fatigue lines it can be stated that the longer serviceability can be assumed in the mixture AC 22 P; I + 3 % FT additive. This comes from the fact the steeper fatigue line the more cycles are needed for achieving certain value of strain. Development of fatigue lines are shown on picture No. 3.



Pic.No.3 - Fatigue resistance of WMA

2.2.3 Stiffness of asphalt mixtures

The value of stiffness modulus can be determined as the change of rheological characteristics of asphalt mixture by short time load. With the increasing value of stiffness modulus the resistance of mixture against affecting load is also increasing. Resistance against affecting load depends on stress and relative strain. Test was realised on roller testing specimens, by the test of indirect pull (IT-CY) [8]. This test was done on mixtures AC 22 P; I and AC 22 P; I + 3 % FT additive. As testing temperature were chosen 0, 15, 27 and 40 °C. With increasing temperature the values of stiffness modulus of stated mixture decrease. The growth of stiffness modulus in mixture with FT additive is for example by 0 °C on 6,5 %, by 40 °C increase on almost 35 %. Resulting values of stiffness modulus with the percentage formulation of increase of stiffness modulus in comparison with reference mixture are shown in table No. 4. Dependence between stiffness modulus and temperature is shown in picture No. 4.



Pic.No.4 - Stiffness modulus (MPa)

Stiffness modulus (MPa) Tab.No.4

Mix	Temperature (°C)	Sm (MPa)	Increase of Sm (%)
AC 22 P; I	0	21499	0
AC 22 P; I + 3% FT	0	22894	6,5
AC 22 P; I	15	9318	0
AC 22 P; I + 3% FT	15	10978	17,8
AC 22 P; I	27	3049	0
AC 22 P; I + 3% FT	27	3957	29,8
AC 22 P; I	40	865	0
AC 22 P; I + 3% FT	40	1167	34,9

Conclusion

Rising and more and more recognizable production and use technologies of asphalt mixtures by lower temperatures represent the future in the field of production and use of asphalt mixtures. Technologies with lower energetic demands bringing many ecological advantages need to be recognised. Results of various experimental verifying show improvements of characteristics of binders modified with various additives and parameters of asphalt mixtures with these binders.

Literature:

1. Department of Transportation, Federal highway administration: International technology scanning programm *Warm-Mix Asphalt: European practice*, U.S. (brochure), 2008.
2. National Asphalt Pavement Association *Warm-Mix Asphalt: Best Practices*, Quality Improvement Series 125, (brochure for free on NAPA website), 2007.
3. ŠTEFUNKOVÁ S. *Stanovenie kvalitatívnych parametrov konštrukčných vrstiev z opätovne použitých materiálov (Determination of qualitative parameters of construction layers of roads from repeatedly used materials)*. Dissertation thesis, Department of Transportation Engineering, Faculty of Civil Engineering, STU in Bratislava, 2011.
4. STN EN 1426 *Asfalty a asfaltové spojivá. Stanovenie penetrácie ihlou*.
5. STN EN 1427 *Asfalty a asfaltové spojivá. Stanovenie bodu mäknutia. Metóda krúžkom a guľôčkou*.

6. STN EN 12697-22 + A1 *Asfaltové zmesi. Skúšobné metódy pre asfaltové zmesi spracované za horúca. Časť 22: Skúška vyjazďovania kolesom (Konsolidovaný text)*
7. STN EN 12697-24 + A1 *Asfaltové zmesi. Skúšobné metódy pre asfaltové zmesi spracované za horúca. Časť 24: Odolnosť proti únave (Konsolidovaný text)*.
8. STN EN 12697-26 *Asfaltové zmesi. Skúšobné metódy pre asfaltové zmesi spracované za horúca. Časť 26: Tuhosť*.
9. STN EN 12593 *Asfalty a asfaltové spojivá. Stanovenie bodu lámavosti podľa Fraasa*.
10. STN EN 13589 *Asfalty a asfaltové spojivá. Určovanie ťahových vlastností modifikovaných asfaltov duktilitovou skúškou (Norma na priame používanie ako STN). V anglickom jazyku*.
11. KLAZ 1/2010 *Katalógové listy asfaltových zmesí, MDPT SR, 2010*.

Primary Paper Section: J

Secondary Paper Section: JN

