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DOES ECONOMIC INTERVENTIONISM HELP STRATEGIC INDUSTRIES? EVIDENCE FROM EUROPE

Anita Maček, Rasto Ovin

Introduction

Inward FDI should stabilize domestic income fluctuations and help investment risks in the domestic economy to disperse, at the same time enabling access to modern technology and financial sector development [8]. Thus they support a typical classical argument for international capital flows liberalization.

There are several studies showing the effects of FDI in different host countries. The earliest studies are showing the positive effects of foreign ownership on productivity in a domestic firm [2], [1]. The same conclusions were later drawn also by some other authors [11], [3]. Other studies show that FDI affect the development potential of the economy as well as reduce unemployment, affect transfer of new technologies and knowledge, generate additional tax revenue for the state, support development strategies of individual sectors, affect the development of managerial knowledge, increase engagement of local companies in supplier and subcontractor networks and generate a better utilisation of the local infrastructure and service activities [15], [5].

The benefits of FDI are not self-evident and greatly differ among different countries. The benefits from FDI are enhanced in an open investment environment with a democratic trade and investment regime, active competition policies, macroeconomic stability and privatisation and deregulation. The distribution of positive compared to the negative effects depends on the economic policy towards these processes and the entrepreneurial environment as well as other factors affecting their consequences [9]. It also often happens that positive effects of these transactions usually occur with a time lag [16].

On the other hand it is important to know, that with unfavourable conditions negative effects of FDI are often. These are especially evident in the form of reducing productivity of the host country, reducing employment, diminished R&D intensity, increased concentration in the domestic market and the closing of companies, shrinking of the domestic stock market because shares are being transferred to a foreign stock market, anti-competitive reactions of the acquired firms, abnormally low sales prices of companies or eliminated competition in the domestic market [18], [19]. In recent years, negative effects often include also threats to national sovereignty and autonomy of the host country and thus losing control of strategic industries, whereby the threat of losing economic independence is especially emphasised [9].

In order to minimize these effects [22] requires cautious economic policy with adjustment of institutional settings and especially competition policy. Real national economic policies therefore often tend to distinguish between greenfield investment and C-B M&A within FDI: better accepted than C-B M&A, greenfield FDI should enable new production, employment and technology. On the other hand, C-B M&A are less stable due to greater mobility of this form of FDI and can include opportunistic capital movements. Although differences between these two forms of FDI diminish in the long term, C-B M&A should bring the following risks to macroeconomic developments:

- Unlike with greenfield investment, with C-B M&A a foreign corporation may buy a local company in order to exclude a competitor in an important market;

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- If it holds a sufficient market share, foreign affiliate with an intention described above may seriously harm competition in the entire domestic market;
- New owners from abroad not involved in domestic environment issues may unproportionally exercise cost reduction thus causing degradation of the acquired company;
- The takeover of the domestic firm may take place in a period of financial crisis or in other circumstances unfavorable to the domestic company, thus the selling price achieved may be too low in comparison to the company's real value;
- In the case when the subject to a bid is a large company stock markets may shrink as through the C-B M&A deal shares have been collected from the domestic public [17].

In 1987, 90% of all inward C-B M&A were realized in industrial countries. Owing to their stronger and stronger incorporation into world trade and capital mobility in the 1990s developing and transition countries became more and more important locations for inward C-B M&A and in 2012 they reached almost 23% of global C-B M&A flows [20]. Despite their relatively higher level of capital saturation compared with developing and transition countries, developed countries retain their dominant position in world C-B M&A also as host countries. After they stabilized on 80% of global inward C-B M&A level towards the end of last decade and losing some pace in 2010 and 2011 (about 75%) the last accessible data 2012 demonstrated their even stronger lead (84%). When taking an example of the EU developed countries such developments are in accordance with expectations basing on better state of their economies regarding stock market capitalization, value addition and the condition of the regulatory and financial institutional setting [16]. Apart from the fact that developed countries are retaining their leading position in EU economy one should, however, note that dimension (consolidation of industries) and dynamics of C-B M&A transactions have progressively earned structural character in their economies. As proven in several analyses traditional leaders of trade and international capital transactions are more and more experiencing the impact of C-B M&A on their economic goals (employment, balance of payments, industrial structure) [10], [12]. These developments bring new experience to the EU developed countries' governments: they are often put into position when their national economic policy makers seem to lose the control over economic goals and especially nationally important or strategic companies or even industries. The above facts support the expectations that the liberalization of international capital mobility within the EU adds to the concerns of national governments. So it is no surprise that it took long lasting process to come to a minimum agreement of international capital mobility rules in the EU common market. Before it was adopted in 2004 it took member countries about 17 years to meet a minimum agreement formalized by the Directive on Takeover bids. Although being formalized in the form of Directive the rules did not prove sustainable from the very beginning and so European capital market in the years after 2004 experienced considerable national economic policy interventions expressing short term view on economic goals fulfillment.

In this article authors discuss the issue of C-B M&A from the point of the lesson that the European evidence could represent to economic policy of an economy, which is shaping its cohabitation in the EU and is eager to steer its economic policy towards reducing its gap towards developed EU industrial countries. It starts with presentation of some of the most known cases of interventionism in Europe after the adoption of EC Directive on takeover bids in 2004. After brief presentation of the results of the Takeover Directive in the first chapter, in the second chapter authors present results of a study measuring economic effects of inward C-B M&A in Europe. By combining the data about economic effects from the study with the data of investment freedom as prepared by Heritage Foundation in 2009 and 2014, authors analyse if strategic sectors benefit from incoming C-B M&A when subject to the previous market oriented industrial policy. The last chapter brings conclusions.

1. Empirical Phenomena

Although liberalization of international capital flows was formally legalized in the EU with the Treaty of Maastricht in 1994, the most relevant

for C-B M&A within the EU is the Directive 2004/25/EC of the European Parliament, and of the Council on Takeover Bids (2004). Despite the fact that the years preceding 2004 were marked by dynamic integration processes between European states, it took 17 years (!) until the text of the directive was acceptable enough so as to be adopted by the EU member states. This is the consequence of the fact that the member states wanted to keep the right to individually define mechanisms for protecting important domestic companies from takeovers after implementing the new EU legislative [6].

Soon after legalization in 2004 the takeover Directive already triggered the concern of European national governments that their national industrial policy supporting other economic goals would be out of control. Foreign spectators warned that the attitude of real economic policy of European governments demonstrated economic nationalism. According to [14] "There is a neo-nationalism in Europe... they don't even believe in their own project. They say they want a big market for capital and goods, but when it doesn't go well, they resort to neo-protectionism." The attitude of the EU governments came out to be the protection of "national champions" – an expression was assigned to the French Prime Minister De Villepin (2005–2007), who deliberately acted against foreign companies' bids for some important French companies. So he prevented an Italian bid for the French water and energy company Suez, and an American bid for the French food empire Danone.

Also, other European countries in the period between 2005 and 2006 offered typical examples of reviving economic nationalism. German chancellor Angela Merkel personally prevented the bid of *Russia Sistema* for a share in the national telephone service provider *Deutsche Telekom*. In Italy the bid for a takeover of highway company *Autostrade* by Spanish *Albertis* was disabled. In Spain, accompanied by political arguing, the takeover of electric company *Endesa* by German *E.ON* was brought to a halt. In Italy an attempt for considerable foreign investment into national telephone service provider *Telecom Italia* by American *AT&T* and Mexican *America Movil* was stopped due to internal political disagreement. Some studies are presenting the concrete cases on interventionism of individual countries and clearly show the defence policy of developed host countries when dealing with C-B M&As in strategic industries [13].

The engagement of most important European economies in these processes, however, differed substantially. According to the IMF in 2006 FDI represented about 13% of GDP in Italy, 25% in Germany, 36% in Britain, and 42% in France. These figures obviously explain why the French government seems to be the most active with protecting their "national champions." On the other hand, however, a lack of such striking examples from Britain despite relatively high share of FDI if compared to their GDP, characterizes the typical Anglo-Saxon attitude of an open economy.

When judging the actions of EU member states' governments, however, one should note that after the adoption of the EU Directive on takeover bids obviously the era of fast growth of inward FDI in the EU has started. So with respect to 2004 and 2005 the growth of FDI as a percentage of gross fixed capital formation in the EU was 125%, while in the same period it grew in developed countries of the world for 41%. Also, in the top 50 pairs of countries with the largest bilateral inward stock, in 2005 22 were from Europe, compared to 17 in 1995 [19]. Considering this and adding quite a high ranking of employment goals and state-supported social cohesion in continental Europe, we should not be surprised that reactions previously described came from ruling parties – coalitions regardless their political orientation.

After eight years of its application the EU Commission analysed the effects of takeover Directive (2012). According to the analysis the Directive did not led to major changes in the member states legislative – allegedly also because of the fact that changes in member countries framework have already been in process in the time of the Directive adoption. As to the transposing of the whole Directive the actions of member states differ quite a lot. While the board neutrality rule ("prevents any action by the company, which could frustrate the bidder without authorization by the general shareholder meeting") was adopted by 19 member states, only three of them transposed the breakthrough rule ("neutralizes the pre-bid defenses during the takeover by making them inoperable during the takeover period) and half

of the states allow the home companies who are subject to a foreign bid, not to apply the two rules mentioned, when the foreign offer or is not subject to the same rule – reciprocity. Nevertheless the analysis states that the shareholders in general believe that the Directive made a difference in the field of coordination that it has strengthened the position of minority shareholders and it improved the disclosure regime. Relevant for the political market exchange and thus influencing economic policy practice is the reluctance towards the Directive by the representatives of employees, stating that the document does not sufficiently protect employees against changing conditions and layoffs after the takeover. In this way the analysis of the Directive implementation points to the fact that the choice of national policies to intervene in the field of intra EU capital movements still exists.

2. Empirical Study on Consequences of the Directive

2.1 The Data, Sample and Method

The research presented in this article is based on the analysis of the relationship between economic effects of C-B M&A and Heritage Foundation Index of Investment Freedom. An international study of C-B M&A's economic effects at the national level was carried out using the method of total analysis. It deliberately considers answers from a survey carried out in chosen academic communities in 2009 because five years after the adoption of Takeover Directive the estimates from academic community were considered to be the most realistic. In the research we presupposed that academic view on economic effects of inward C-B M&A in their home country would stay relevant for at least mid-term period, here meaning 5–10 years, as one of the academics' mission is to retain robust position with current issues of economic policy. The research was carried out through estimation of two equations. With the first one the relationship between results of a study 2009 (especially government intervention and economic position of strategic sectors) and Index of Investment Freedom for 2009 and with the second one the relationship between results of a study 2009 and the same Index for 2014 was tested.

Respondents in the survey from 2009 were professionals from business schools, who in one way or another are following real practice in the field in their home countries. In our research, we considered the respondents' view as typical and respectively representative for the country in which business school is located. This could include the risk of a personal bias. However, the respondents were invited to participate by individual schools' deans according to their field of research and teaching. As a rule they were in one way or another actively involved in the field of C-B M&A in their countries, or were at least well-acquainted with professional or public discussion on the matter in local circles and in the media.

In this way the quality of answers does not lag behind the quality of answers obtained in other known studies using a similar methodology. One that should be mentioned is the analysis of public sentiment with Norway bank takeover by analyzing printed media [21]. The methodology used is to a certain extent comparable with the study of European Group for Investor Protection [4], where answers are obtained by interviewing government officials in individual states, and with the study of Global Financial Communication Network [7] where authors rely on the opinion of editors and top journalists on C-B M&A effects. Considering the types of involvement of respondents in our study, one could rate the method used less prone to political or popular bias.

The study 2009 was carried out with the help of a questionnaire consisting of 21 questions in the fields of macroeconomic and microeconomic effects of inward C-B M&A in European economies.

The sample included 109 business schools from the following 36 countries (the number of respondents is in parentheses): Austria (4), Belarus (2), Belgium (2), Bosnia and Herzegovina (2), Bulgaria (2), Croatia (4), Cyprus (2), Czech Republic (4), Denmark (2), Estonia (2), Finland (2), France (2), Germany (3), Georgia (2), Greece (2), Hungary (4), Ireland (2), Italy (3), Island (2), Latvia (3), Lithuania (6), Netherlands (2), Norway (2), Poland (4), Portugal (2), Romania (4), Russia (4), Slovakia (3), Slovenia (4), Spain (5), Serbia and Montenegro (2), Sweden (2), Switzerland (2), Turkey (4), UK (3) and Ukraine (4). In most parts of this research, we divided these countries into two groups:

developed countries and transition countries. As developed countries we have considered old EU members before 2004 EU enlargement, Island, Norway and Switzerland plus Turkey. Although there are considerable differences among them, these countries have been experiencing western type of democracy, market economy and private ownership. They are: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Island, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and UK. On the other side as transition countries considered are European countries and Russia, who after World War II shared state ownership, central planning and mono-party system. We presupposed that these heritages should define a different need for privatization, to replace obsolete capacities in manufacturing and to develop markets and hierarchies typical for a market economy – all being normal consequences of inward C-B M&As. The countries representing this group are: Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia plus Serbia and Montenegro.

For statistical analysis the program SPSS-X for Windows and Microsoft Excel were used. By using linear regression the compatibility of the results from the questionnaire was as already mentioned tested with Index of Economic Freedom as a part of Index of Economic Freedom by the Heritage Foundation (for years 2009 and 2014). The results of the study were considered compatible to the index mentioned above as the equation coefficients were statistically significant.

2.2 Main Results about Economic Effects

The statistical source related to macro-economic consequences consists of eight sets of questions referring to benefits and threats that inward C-B M&A caused in receiving economies.

When benefits are concerned, the strongest statistical significance was in both groups of countries assigned to market access and know-how, followed by technology transfer. Respondents in transition countries stressed – relative to those from developed countries – stronger pressure of international investors on national economic policy. The most important threats to transition countries were the crowding-out of domestic companies by foreign bidders and insufficient price achieved for sold domestic companies. Those two threats were also quite strongly present in developed countries, however with substantially lower importance relative to transition economies.

An analysis of microeconomic effects shows divergent results for both groups of countries to a certain extent. For developed countries the biggest benefit of C-B M&A proved to be the consolidation of strategic sectors, while the reduction of domestic firms' capital was on the top on the list as a threat. In transition countries the consolidation of strategic sectors was also considered on the top of benefits, while as the top threat informal pressure of foreign investors on market conditions. This effect of C-B M&A registered in developed countries quite a low value. The less present effect in both groups of countries here was contraction and the closing of R&D departments of firms acquired from foreign companies. Among microeconomic effects also the forms of acculturation with inward C-B M&A were analyzed. With 62% (transition countries) and 67% (developed countries) the biggest weight was assigned to integration as a form of acculturation. Readiness for assimilation in transition countries (36% vs. 29%) was expectedly higher than in industrial countries, while separation was quoted as an exception in both groups of countries.

In general, the obtained results of the study enable us to conclude that despite differences between both groups of economies with inward FDI in the form of C-B M&A in 2009 mostly positive effects in both countries were present. These findings diverge from real policies of industrial states described above.

Theory and own research in this way lead to the conclusion that when subject to consistent marked founded industrial policy the strategic sectors should benefit from C-B M&A as these transactions would help industry consolidation. Unlike rational industrial policy that would through supporting market adjustment strengthen strategic sectors, rather mercantilist state sheltering of these sectors would lead to unwanted sensibility. We tested this thesis and are presenting the results below.

2.3 Is Protectionism Serving Nationally Important Companies?

For testing the relationship between consistent market adjusted industrial policy and the C-B M&As' effects on strategic sectors, we exposed the results of the 2009 study to the Heritage Foundation Index of Economic Freedom – Index of Investment Freedom (IIF) for the same economies in the same year. Following the mid-term character of the data collected with the questionnaire for the study 2009 we took the latest IIF indicators for the year 2014 and included them in to the equation together with the indicators of economic effects of C-B M&As as estimated by the academics interviewed five years ago. In this way the statistical and analytical quality of the first equation which should provide us with stylized facts was proved. For the subjects of economic policy in European countries – and especial transition ones confirmation of the article thesis would be of help when judging political decisions with their industrial policy.

As already mentioned we first started with the analysis using the IIF for 2009. Our expectation was that less frequent the intervention of governments in the C-B M&A processes in order to protect the domestic economy and shareholders cause an increase in the free flow of investment. Therefore the model in the form:

$$Y = \beta_0 - \beta_1 x_1 + \beta_2 x_2 \qquad (1)$$

was expected. The following variables were included in the model:

- $INDEX_{IIF(2009)}$ – Index of Investment freedom for chosen economies in 2009;
- *GI* – government intervention in the C-B M&A processes in order to protect the domestic economy and shareholders;
- *SE* – Strengthening of the economic position of strategic sectors as a consequence of C-B M&A

The scatter plots indicated a good linear relationship between $INDEX_{IIF}$ and GI plus SE. So as to estimate a linear regression equation we carried out econometrical tests using variables provided by the study 2009 together with $INDEX_{IIF}$. The results are organized in the following three tables. Table 1 below shows the multiple linear regression model summary and overall fit statistics.

Tab. 1: Multiple linear regression summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.493(a)	.243	.194	.15586	2.170

Source: own

Table 1 brings multiple linear regression summary. The adjusted R^2 in our model was 0.194 with the R^2 = 0.243. Thus, the linear regression explains 24.3% of the variance in the data. The Durbin-Watson test d = 2.170 was between the two critical values of 1.5 < d < 2.5, and therefore it can be assumed that there was no first order linear autocorrelation in our multiple linear regression data.

Table 2 shows the results of ANOVA F-test.

Tab. 2: ANOVA F-test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.241	2	.121	4.968	.013(b)
	Residual	.753	31	.024		
	Total	.994	33			

Source: own

The ANOVA F-test in Table 2 includes the null hypothesis that there is no linear relationship between the variables. F-test is highly significant (the *P*-value for the F test statistic is less than 0.05, thus providing strong evidence against the null hypothesis). In this way we can assume that a linear relationship between the variables in our model exists. Table 3 shows coefficients of linear regression.

Tab. 3: Coefficients

Model		Unstandard. Coefficients		Standard. Coeffic.	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	Constant	.630	.128		4.908	.000		
	GI	-.067	.027	-.382	-2.446	.020	.999	1.001
	SE	.067	.033	.323	2.065	.047	.999	1.001

a Predictors: (Constant), GI,SE

b Dependent Variable: $INDEX_{IIF(2009)}$

Source: own

Beta coefficients from the Table 3 express the relative importance of each independent variable in standardized form. We found that GI and SE are significant predictors and that GI has a higher impact on the $INDEX_{IIF(2009)}$ than SE (beta = -0.382 and beta = 0.323). In the Table 3 also a multicollinearity test for our model is presented. As the tolerance should be > 0.1 (or VIF statistics should be < 10) for all included variables, this requirement was fulfilled with achieved VIF values 1.00.

The coefficients obtained above give the following equation:

$$INDEX_{IIF(2009)} = \underset{(0.000)}{0.630} - \underset{(0.020)}{0.067GI} + \underset{(0.047)}{0.067SE} \quad (2)$$

Equation (2) shows that less frequent the intervention of governments in the C-B M&A processes in order to protect the domestic economy and shareholders cause an increase in the free flow of investment. On the other hand, strengthening of the economic position of strategic sectors as a consequence of C-B M&A, increases the value of $INDEX_{IIF(2009)}$. According to these results the best solution for strategic enterprises should be to enable them to open to the international economic environment.

The second step of our research was testing the results of the study with the IIF 2014. The main aim of this step was to check whether judgments of the academic community to which mid-term relevance was ascribed could be considered relevant also after five years following the real experience as basis of their judgement. The thesis here was the same is it was for IIF 2009. We expected that values of descriptors in the linear equation will not differ essentially from the ones in 2009.

Below we present the main results and respectively descriptive statistics for the equation for the IIF data for 2014. Table 4 presents model summary.

Tab. 4: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.541(a)	.292	.247	.15859	1.920

Source: own

The determination coefficient R^2 = 0.292 from Table 4 shows that the linear regression explains 29.2% of the variance in the data. The value of the Durbin-Watson test is 1.920, so there is no first order linear autocorrelation in our multiple linear regression data. The results from ANOVA F-test are presented in the Table 5.

Tab. 5: ANOVA F-test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.322	2	.161	6.404	.005(a)
	Residual	.780	31	.025		
	Total	1.102	33			

Source: own

ANOVA F-test from Table 5 is highly significant (F=6.404, P=0.005), thus we can assume that there is a linear relationship between IG, SE, and $INDEX_{IIF(2014)}$. In Table 6 coefficients for regression are presented.

Tab. 6: Coefficients

Model		Unstandard. Coefficients		Standard. Coeffic.	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	Constant	.620	.131		4.747	.000		
	GI	-.064	.028	-.351	-2.320	.027	.999	1.001
	SE	.093	.033	.423	2.796	.009	.999	1.001

a Predictors: (Constant), GI, SE

b Dependent Variable: $INDEX_{IIF(2014)}$

Source: own

In the Table 6 we see that IG and SE are significant predictors. Values of VIF test proves that no multicollinearty exists. Following these results the equation including all previous presented variables is:

$$INDEX_{IIF(2014)} = 0.620 - 0.064GI + 0.093SE \quad (4)$$
$$(0.000) \quad (0.009) \quad (0.027)$$

Equation 4 supports the thesis presented above. It demonstrates that with less intervention of governments in the C-B M&A the value of Index of Investment Freedom is higher. At the same time the higher value of index is explained with improvement of strategic sectors' economic position. Better value of the index thus demonstrates better environment for strategic sectors development. The significance of the GI variable demonstrates economic policy attitude towards protection of domestic shareholders and companies in general. Here as the matter of fact domestic and international transactions cannot be distinguished and so less discretionary economic policy approach means less intervention also in the field of C-B M&A. This, however, supports the conviction that national economic policy reaction on inward C-B M&A flows also reflects the economic freedom in a given economy.

Following to the fact that between the two equations only irrelevant differences in descriptors as well as with statistics appear, we can conclude that the (explanatory) variables obtained through 2009 study approach are relevant and that the thesis could be confirmed even after almost five year time span.

This could be therefore of use for consideration by the national governments especially in European transition and pre-accession countries.

Conclusions

Although most of studies prove positive effects of C-B M&A we should be aware that these processes, when big enough, may influence economic goals of a country. With typically interventionist style of economic policy in biggest continental EU economies (Germany, France, Italy, Spain) the FDI often proves to be

a source of disharmony between government and businesses.

The revival of interventionism (including elements of economic nationalism) in Europe might have been triggered by the liberalization of international capital flows after adopting the EU Directive on takeover bids in 2004. Activist reaction of the most important EU governments except for Great Britain in this way actually demonstrated that when goals of economic growth and employment are concerned, they rely rather to their control over nationally important sectors and companies than to the opening of the economy.

Our study on inward Cc-B M&A in Europe proves that the interested (academic) community has judged benefits and threats of C-B M&A much less critical than real economic policy. In order to prove which standing is closer to the facts, an additional analysis by introducing existing international FDI indicators was carried out. By using models, where our results were combined with the Index of Investment Freedom (Heritage Foundation), we carried out linear regression.

With the first equation the relationship between results of a study 2009 and Index of Investment Freedom for 2009 and with the second one the relationship between results of a study and the same Index for 2014 was tested. As academics' mission is also to retain robust position with current issues of economic policy we presupposed in the research that their view on economic effects of inward C-B M&A in their home country would stay relevant for at least mid-term period, here meaning 5–10 years.

The obtained equations for both periods were almost identical. As despite the financial and economic crisis the IIF was not subject to notable changes it enables us to conclude that nothing significant also happened in the field of the C-B M&A economic effects for the host economies, that would trigger economic policy protectionist action. Of course this again would be offset in the individual countries' IIF value, which did not happen.

We can conclude that according to our research C-B M&A should promote a consolidation of strategic sectors, thus suggesting that the openness of countries has positive consequences for the development of these sectors. So basing on these results we can assume that once, establishing themselves as strategic sectors and companies – the latter gains on economic strength when involved in free international capital flows and when government intervention for their protection and for protection of their shareholders is reduced.

References

[1] BLOMSTROM, M. and PERSSON, H. Foreign Investment and Spillover Efficiency in an Underdeveloped Economy: Evidence from the Mexican Manufacturing Industry. *World Development.* 1983, Vol. 11, No. 6, pp. 493-501. ISSN 0305-750X.

[2] CAVES, R.E. Multinational firms, Competition and Productivity in Host-Country Markets. *Economica.* 1974, Vol. 41, No. 5, pp. 176-193. ISSN 1468-2702.

[3] DRIFFIELD, N. The Impact on Domestic Productivity of Inward Investment in the UK. *The Manchester School.* 2001, Vol. 69, No. 1, pp. 103-119. ISSN 1467-9957.

[4] EGIP. *European Group for investor protection* [online]. 2005 [cit. 2007-09-22]. Available from: http://www.egip.org/root/index.php?page_id=128.

[5] ESTRIN, S., HUGHES, K.S. and TODD, S. *Foreign Direct Investment in Central and Eastern Europe: multinationals in transition.* London: Royal Institute of International Affairs, 1997. 276 p. ISBN 978-1855674813.

[6] FRESHFIELDS BRUCKHAUS DERINGER. *Public takeovers in Europe* [online]. 2006 [cit. 2007-05-04]. 56 p. (PDF). Available from: http://www.freshfields.com/uploadedFiles/SiteWide/Knowledge/Public%20takeovers%20in%20Europe.pdf.

[7] GFC/NET. *Economic Patriotism/Nationalism Likely to Intensify According to Business Journalists Worldwide. Business Wire* [online]. Global Financial Communication Network, 2007 [cit. 2007-12-09]. Available from: http://www.allbusiness.com/trade-development/trade-development-fi nance/5420005-1.html.

[8] KAMINSKY, G.L. International Capital Flows, Financial Stability and Growth. *DESA Working Paper* [online]. 2005, No. 10 [cit. 2007-03-05]. 24 p. (PDF). Available from: http://www.un.org/esa/desa/papers/2005/wp10_2005.pdf.

[9] LIN, C.H. Role of Foreign Direct Investment in Telecommunication Industries: A Developing Countries' Perspective. *Contemporary Management Research.* 2008, Vol. 4, No. 1, pp. 29-42. ISSN 1813-5498.

[10] LIPSEY, R.E. *Interpreting Developed Countries' Foreign Direct Investment* [online]. National Bureau of Economic Research, 2000. Working paper No. 7810 [cit. 2007-05-04]. Available from: http://www.nber.org/papers/w7810.
[11] LIU, X., SILER, P., WANG, C. and WEI, Y. Productivity Spillovers from Foreign Direct Investment: Evidence from UK Industry Level Panel Data. *Journal of International Business Studies*. 2000, Vol. 31, No. 3, pp. 407-425. ISSN 0047-2506.
[12] MAČEK, A. *Čezmejne združitve in prevzemi kot dejavnik tranzicije v EU*. Doktorska disertacija. UM, Ekonomsko-poslovna fakulteta. (*Cross-Border Mergers and Acquisitions as a Factor of the Transition in the EU – a doctoral thesis, University of Maribor, Faculty of Economics and Business).* 2009.
[13] MARCHICK, D.M., SLAUGHTER, M.J. *Global FDI policy: correcting a protectionist drift* [online]. Council on Foreign relations, 2008. CSR No. 32 [cit. 2008-06-15]. Available from: www.cfr.org/content/publications/attachments/FDI_CSR34.pdf.
[14] PAPE, E., DICKEY, C. Rising Barriers; French Prime Minister Dominique De Villepin Is Leading a New Wave of Protectionism-In Europe-But Also, Possibly, One of Reform. *Newsweek international*. 2006, March 20. ISSN 0163-7053.
[15] PEREZ, T. *Multinational Enterprises and Technological Spillovers*. Amsterdam: Harwood, 1998. ISBN 90-5702-295-8.
[16] REISEN, H. *After the Great Asian Slump: Towards a Coherent Approach to Global Capital Flows*. *Policy Brief*. Paris: OECD Development Centre. 1999, No. 16. ISSN 2077-1681.
[17] TANDON, Y. *M&A is takeover of firms in north, economies in south* [online]. Geneva: Third world network, 2000 [cit. 2005-02-04]. Available from: http://www.twnside.org.sg/title/firms.htm.
[18] TSANG, M., HAUCK, D. *Stock Markets Contract as M&A Overtakes Equity Sales* [online]. Bloomberg, 2007-01-08 [cit. 2009-01-09]. Available from: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a7IeW7BtD0dQ.
[19] UNCTAD. *World Investment Report 2007. Transnational Corporations. Extractive Industries and Development* [online]. United Nations: UNCTAD, 2007 [cit. 2012-08-05]. Available from: http://unctad.org/en/pages/PublicationArchive.aspx?publicationid= 724.
[20] UNCTAD. *World Investment Report 2013. Global value chains: investment and trade for development* [online]. New York and Geneva: United Nations. UNCTAD, 2013 [cit. 2014-03-02]. Available from: http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid =588.
[21] VAARA, E., TIENARI, J., SAURI, N., BJOERKMAN, I. *Global Capitalism Meets National Spirit: Discourses in Media Texts on a Cross-Border Acquisition*. The 2nd Critical Studies Conference [online]. Manchester, 2001 [cit. 2004-09-11]. 21 p. (PDF). Available from: http://www.mngt.waikato.ac.nz/ejrot/cmsconference/2001/Papers/Lanaguage%20of%20New%20Capitalism/Vaara.pdf.
[22] WYPLOSZ, C. How Risky is Financial Liberalization in the Developing Countries? *CEPR Discussion Paper* [online]. Geneva: University of Geneva, 2001 [cit. 09-01-2007]. Available from: http://www.cepr.org/pubs/dps/DP2724.asp.

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Abstract

DOES ECONOMIC INTERVENTIONISM HELP STRATEGIC INDUSTRIES? EVIDENCE FROM EUROPE

Anita Maček, Rasto Ovin

Although most studies proves that Cross-Border Mergers and Acquisitions (C-B M&A) cause more benefits than threats, the real economic policy in the EU countries offsets the fear that liberalization of inward C-B M&A would endanger economic position of strategic industries and thus national economic goals.

After the adoption of EU Directive 2004/25/EC on Takeover Bids the era of fast growth of inward C-B M&A in the EU and consequently the era of rising interventionism so as to protect national strategic industries and companies has started. Additional stimulus for the European Union's (EU) most developed economies to exercise interventionism was financial and economic crisis starting in 2008. Considering high ranking of employment goals and state-supported social cohesion in continental Europe, it is not surprise that interventionist reactions came from ruling parties and coalitions regardless their political orientation.

By the help of the results of their 2009 empirical study on C-B M&A authors tested the relation between the results referring to C-B M&A effects on strategic sectors and the Heritage Foundation Index of Investment Freedom. With combining the results from 2009 study with Index of Investment Freedom from 2009 and in the second equation with index from 2014 authors checked if strategic sectors benefit from incoming C-B M&A when subject to the previous market oriented industrial policy.

Both estimated equations proves that unlike with sheltering economic policy, when subject to market conform measures of industrial policy, strategic sectors will benefit from inward C-B M&A. By proving the statistical significant relationship between the results from 2009 study and Index from 2014 authors also proved the statistical and analytical quality of the equation from 2009. By proving statistical significance of the second equation we proved that the judgement of the academic community could be considered relevant also after five years following the real experience as basis of their judgement.

Key Words: *Cross-border mergers and acquisitions, economic interventionism, strategic industries.*

JEL Classification: *C3, E2, F2.*

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THE ISSUE OF INCOME REDISTRIBUTION

Beáta Mikušová Meričková, Renáta Halásková

Introduction

One of the conditions for an operating economy is the social appeasement. Massive income disparities can have negative impact on economy [27]. The social appeasement must be obtained by the income transfers between members of society realised in through the public finance system. These transfers in the theory of public finance [1], [6], [21] is called income redistribution. Nowadays, the transfer payments represent on average a half of total public expenditures in developed countries and their extent keeps increasing [1], [10], [11], [13], [19], [26]. The issue of need and extent of income redistribution is therefore one of the most often discussed issues and has not only the economic and social, but also the political dimension.

This study goal is to provide empirical view on the issue of optimal scale and character of redistribution processes, namely based on a theoretical framework of income redistribution within the neoclassical welfare economy and analysis of the selected spheres of social policy in relation to the economic performance and growth. In line with the goal there is defined subject of research i.e. the mutual relationship of social and macroeconomics policy in the narrower sense. The quantitative research of the existence and character of this relationship assumes the selection of social policy tools quantified through the social protection expenditure. We focus on key areas of social policy and we monitor the data on social expenditure on family, old age (The European System of Integrated Social Protection Statistics terminology for defining one of social protection function) and unemployment.

1. Theoretical Framework for Research of the Relationship between the Redistribution and Economic Development

Welfare economics represents a neoclassical view on redistribution [1], [6]. It deals with the function of social welfare, i.e. public interest, and aims to analyse the conditions of its maximising under specific circumstances, i.e. the amount and quality of production resources available, and demands, which are advisable to be satisfied. Public interest is often grasped differently, even contradictorily, which is why its general definition is difficult to provide [15], [21]. The very first person to set public interest into a wider context and to identify public interest with justice was Jeremy Bentham, who provided a definition based on the principles of utilitarianism (these were developed further in work by John Stuart Mill and John Austin). Bentham [3] defined public interest, in other words the interest of a group consisting of individuals, in the introductory part of his paper "Introduction to the Principles of Morals and Legislation" as the sum of individual interests of the individuals (W = U1 + U2 + ... + Un). To maximize the sum of individual well-beings, i.e. social welfare (W), the utilitarian theory postulates redistribution be needed among individuals in such manner so that each individual profited from the income equity. This more or less logical utilitarian reason for the need for income redistribution in society to maximize social welfare, however, encounters numerous methodological problems.

In a society, considering a developed society with a large number of members, where individuals may freely use their knowledge and skills to reach their individual usefulness, no public interest controlled by the government can be defined as the sum of the aforementioned individual usefulness, and neither the government nor anyone else is capable of

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recognizing the circumstances of their achieving. Public interest cannot be a sum of individual needs based on very simple reason: those defining the rules for public-interest achievement are unable to know the whole host of individual interests, of which the public interest should be, according the utilitarian principles, comprised, nor is each individual interest in line with the public one. And it is the aspect of ignorance of all circumstances associated with achieving each individual interest in society that is missing in the utilitarian definition.

Another issue arises during interpersonal comparison of individual usefulness – welfare economics working with the utilitarian concept automatically presupposes higher individual usefulness in individuals with higher income. Nevertheless, is the notion that more money goes hand in hand with higher rate of usefulness, satisfaction and luck adequate?

The stated methodological issues cast doubt on the justification of redistribution from the economic viewpoint (still, from the social perspective, its need is maintained). Also, financial expenses on redistribution processes [22] raise the issue of the compromise between efficiency and equity, which redistribution represents.

The specific nature of this compromise is described in the relation between social protection and economic development. It is defined by means of statistical testing of mutual dependence of the economic-development level (quantified in numerous papers through the Human Development Index – HDI [5], [7], [10], [23]) and of the extent of social protection (redistribution in its practical form – [9], [13], [14], [17], [22]).

2. Methodology of the Study

What is being statistically tested is *the research matter of the existence of the relation between the extent of selected types of expenditures on social protection* (expenditures on families, old age and unemployment) *and the achieved level of economic development*, quantified with the HDI.

The object of quantitative analysis, the selected sample, comprises the following countries: Slovakia, Czech Republic, Hungary, Poland, Great Britain, Sweden, France, Germany, Thailand, Austria, USA, Canada, Australia, Japan and Mexico. The sample was deliberately selected in order to ensure its heterogeneity from the viewpoint of observed indicators/variables influencing the statistical testing. With regard to availability, the indicators pertain to the periods of: 2009–2005, 2000, 1995 and 1990.

Key *methods of scientific research* are those based on analytic classification of selected theoretical approaches of the theory of public finances and approaches to evaluation of economic development aiming to define theoretical connections of the relation between redistribution and economic development (to find a way to approach the matter of "productive" expenditures of social protection), comparison and abstraction in creation of the theoretical-methodological frame for the solution; methods of causal analysis and comparison when solving the defined research question in the application part, and methods of synthesis and partial induction when concluding the outcomes. The complexity in the space of global economy entails a high degree of abstraction in research of secondary character. Secondary collecting of data from available OECD statistics was carried out through the constructive method, and its processing and interpretation through statistical methods with the emphasis placed on correlation analysis. Testing of the relation between social protection and economic development was carried out using the method of the Pearson correlation coefficient. From the perspective of standardized method of statistical testing of the dependence of variables (e.g. Spearman's rank correlation coefficient, where no linearity of the expected relationship or the common distribution of two variables can be supposed, Kendall's coefficient of concordance, based on data related to metric or ordinary evaluation of n objects ($i = 1, 2, \ldots, n$) according to two criteria X and Y) [16], [18] and the character of available data, the method using the Pearson's correlation coefficient appears the most appropriate.

The Pearson correlation coefficient determines the strength of the dependence between observed variables. It shows the level of closeness of linear dependence. The estimate of a pair correlation coefficient is defined as the estimate of covariance x and y divided by the multiplication of estimates of their standard deviations, i.e.

$$r_{yx} = \frac{cov_{xy}}{s_x s_y} \quad (1)$$

where cov xy is the covariance between x and y a can be calculated as the average of multiplication of deviations, i.e. it is a "common" measure of variability (covariance) for two features (x and y).

The equation is based upon covariance, which is the level of mixed variability of variables x and y.

$$\text{cov xy} = \frac{1}{n}\sum_{i=1}^{n}(x\text{i} - \bar{x})(y\text{i} - \bar{y}) = \overline{xy} - \bar{x} \cdot \bar{y} \quad (2)$$

The coefficient of pair correlation (Pearson's correlation coefficient) has the values ranging from <-1,+1>, while the more the value approaches -1, the closer the correlation (direct linear correlation in case of positive values, indirect in case of negative ones); the more it approaches zero, the weaker the correlation is. Correlation coefficients provide, on both sides, the dependence between x and y [16], [28]. The value of correlation coefficient identifies the presence of dependence relation between the level of economic development and the extent of social protection and its intensity in accordance with the following scale [18].

Weak correlation	Moderate correlation	Strong correlation
<0;0.3>	<0.3;0.7>	<0.7;1>

The calculations in the following part are the output of the SPSS Statistics 18.0 software.

3. Relationship between Redistribution and Economic Development

According to Esspros [8] expenditures on social protection are divided into four categories. The first one are expenditures on social benefits, which are resources in the form of cash, products or services. The second category relates to administrative expenses, connected with the system of providing social protection. The third and fourth category deals with transfers into other systems and various expenditures. Esspros [8] defines social protection as encompassing all interventions from public or private bodies intended to relieve households and individuals of the burden of a defined set of risks or needs, defined through eight functions of social protection: sickness/ /health care, disability, old age, survivors, family/children, unemployment, housing, social exclusion not elsewhere classified.

Categories of expenditures on social protection (expenditures of social protection on old age, family policy and unemployment) have been selected based on these functions with regard to the selected group, where at least a minimal extent of social protection in these areas (for the poorest) is supposed also in countries with a liberal approach to social policy.

This study is focused on three types of social protection expenditures according to functions – in the area of family policy, on unemployment and old age, in selected countries and periods of time. The following tables provide their level.

Family policy is grasped and implemented as a set of practical measures focused on the family unit and on family support in terms of social policy. In the EU, family policy is within the authority of each member state and its content at the supranational level is defined clearly. Based on the aims and instruments, elementary systems of family policies is defined (liberal, social-market, universalistic). [14], [17], [22], [25]. In scientific papers [4], [14] five elementary models of protecting family with children (Anglo-Scandinavian model, German-Italian model, solidarity model, e.g. France, liberal model, e.g. USA, Canada and Russian model for post-communist countries. A specific alternative of family policy is mostly a combination of aspects of more than one system, and for their definition, the majority of system parts is essential.

Expenditures of social protection in family policy include family allowances, maternity and paternal leave, other cash benefits, day-care/home-help services, other benefits in kind. Their structure and proportion differs across countries in accordance with an adopted concept of family policy. Mainly the liberal model of family policy of the USA or Canada (without a complete system of family benefits, big emphasis is put on means – testing with targeted benefits for low-income families) and the model of family policy in Sweden, where all family with children obtain universal benefits regardless of their income, are considered extreme. One of the most advanced, thus most expensive, in the world is the system of family benefits in France. Similarly to Sweden, France also provides extensive benefits for children, advantaging families with a larger number of children. In Great Britain, family policy fails to

have an established tradition and runs counter to the ideas of liberalism. Families with children obtain universal child benefits and other benefits for low-income or incomplete families. Unlike other European countries, Italy shows a lower interest in family policy (typical conservative family model), with characteristic tested family benefits and strong influence of the church. This is connected with a rather limited extent of family benefits and other forms of help) [4], [22], [25].

The ratio of social protection expenditures in family policy as % of the GDP according to OECD statistical data in selected countries is shown in Table 1.

Tab. 1: Social protection expenditure in the area of family policy [%]

	1990	1995	2000	2005	2006	2007	2008	2009
Australia	1.5	2.7	2.9	2.7	2.6	2.5	3.3	2.8
Austria	2.6	3.1	2.8	2.8	2.7	2.6	2.7	2.9
Canada	0.6	0.8	1.0	1.1	1.0	1.1	1.0	1.1
Czech Republic	2.4	1.9	1.9	1.7	1.6	1.9	1.7	1.8
France	2.5	2.7	3.0	3.0	3.0	3.0	3	3.2
Germany	1.6	2.1	2.1	2.1	1.8	1.8	1.9	2.1
Hungary	..	..	3.1	3.1	3.4	3.4	3.4	3.6
Italy	0.8	0.6	1.1	1.3	1.4	1.4	1.4	1.6
Japan	0.4	0.5	0.6	0.8	0.8	0.8	0.9	1.0
Mexico	0	0.1	0.7	1.0	1.0	1.0	1.1	1.1
Poland	1.7	1.1	1.2	1.1	1.1	1.1	1.1	1.1
Slovak Republic	..	2.5	2.0	1.9	1.9	1.8	1.7	2.0
Sweden	4.4	3.8	3	3.3	3.4	3.4	3.5	3.7
United Kingdom	1.9	2.3	2.7	3.2	3.1	3.3	3.5	3.8
USA	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7

Source: own processing according to [20]

In the observed period, the lowest share of social protection expenditures on family policy (Tab. 1) was provided in the USA, Japan, Mexico and Canada, By contrast, the largest share of expenditures on family policy was noticed in Sweden and Hungary, which are countries with the most generous system of social policy and high level of redistribution. Since 2005, also the United Kingdom of Great Britain and Northern Ireland was achieving the biggest share of expenditures on family policy.

Employment policy should constitute a set of measures that create conditions for dynamic balance on the labour market and for efficient usage of the manpower. In developed countries (where specific differences are present), limitation of preferences connected with income protection of the unemployed in terms of the passive unemployment policy is typical, and what is more emphasised is investing in people and their abilities in terms of the programs of active employment policy [2], [9], [22]. However, the right for income in case of unemployment is anchored in legal systems of most European countries [17], [22], [24]. In the Scandinavian model of employment policy, the government tries to maintain full employment at the expense of an increasing tax burden. The right for job is connected with the duty to accept an occupation and to be active on the labour market (which is typical of Sweden). In the model of consensual, corporate democracy, coordinated negotiations on salaries through tripartite, supported by institutions and traditions (typical of Germany and Austria) take place. In the market-liberal model of

employment policy, unemployment is taken as a necessary part of a functioning economics (typical of the USA). When comparing the models of employment policy [9], [22], [24], Sweden (Scandinavian model) has high protections of workers and also the highest expenditures on active employment policy. Germany, Austria (model of consensual corporate democracy) guarantee a higher protection of workers than is typical of countries of the Scandinavian model, and also have the second highest expenditures on active employment policy. Countries with the liberal model of employment policy have a very flexible labour market, measured through the proportion of worker protection, and expenditures on active employment policy, which are relatively small.

Social protection expenditures on passive employment policy (unemployment compensation /severance pay) differ in countries (according to the duration of providing and to % from the previous income) according to the concept of the adopted employment policy. Their level as the % of GDP, based on OECD data in selected countries, is shown in Table 2.

Tab. 2: Social protection expenditure in the area of employment policy [%]

	1990	1995	2000	2005	2006	2007	2008	2009
Australia	1.1	1.2	0.9	0.5	0.5	0.4	0.4	0.5
Austria	0.9	1.3	0.9	1.1	1.0	0.9	0.9	1.1
Canada	1.9	1.3	0.7	0.6	0.6	0.6	0.7	1.0
Czech Republic	..	0.4	0.6	0.6	0.5	0.6	0.6	1.0
France	1.7	1.6	1.5	1.7	1.5	1.4	1.3	1.5
Germany	0.8	1.5	1.3	1.9	1.7	1.4	1.3	1.7
Hungary	..	0.9	0.7	0.6	0.6	0.7	0.7	0.9
Italy	0.6	0.7	0.4	0.5	0.5	0.4	0.5	0.8
Japan	0.3	0.5	0.6	0.3	0.3	0.3	0.4	0.7
Mexico	-	-	-	-	-	-	-	-
Poland	0	1.6	0.9	0.5	0.5	0.3	0.2	0.3
Slovak Republic	..	0.4	0.6	0.3	0.3	0.4	0.4	0.7
Sweden	0.9	2.3	1.4	1.2	1.0	0.7	0.5	0.7
United Kingdom	0.7	0.9	0.3	0.3	0.2	0.2	0.3	0.5
USA	0.4	0.3	0.2	0.3	0.3	0.3	0.3	0.9

Source: own processing according to [20]

Note: The social protection expenditure in the sphere of employment policy in Mexico was not available in the monitored years

Over the observed period, the share of social protection expenditures in the area of employment policy as a GDP share ranged from 0.2–1.9% in the selected countries (see Tab. 2). A slightly increasing tendency of the shares of expenditures in the area of employment policy was observed mainly in Japan and the USA, from European countries in Germany, the Czech Republic, Italy and Slovakia. By contrast, a slightly decreasing share of expenditures in the area of employment policy was observed in Australia, in Europe in France, Poland, Sweden or the United Kingdom. The highest share of expenditures on employment policy was observed in France and Germany in 2009, by contrast the lowest share was in Poland. The share of expenditures on social protection, which individual countries allocate for the area of employment policy as a GDP share, is relatively small in comparison with the share of expenditures on old age (Tab. 3).

Pension system as one of the main parts of social protection constitutes a system which concentrates the biggest economic potential

regardless of the system of financing (pay-as-you go, or capitalisation). Pension systems determine the standard of living of a significant part of population, and consequently its consumption, and have an impact on economy. They are influenced by economic stability or instability of a country, but also by other factors, such as employment or population development. Their financing is part of public finances, which influences their quality and sustainability [2], [22], [25]. OECD data shows that out of total public social expenditures, expenditures of social protections on old age constituted 54% in Italy (south-European model of social protection), 41% in Austria, 36% in France and Germany (model of western continental Europe), 34% in Sweden (Scandinavian model). From the total expenditures of social protection in countries with liberal model of social policy, expenditures on old age reached, for instance, 21% in Canada and 17% in Mexico. In former post-communist countries, it was, for example, 38% in the Czech Republic and Hungary, 34% in Slovakia and 45% in Poland. Basic regimes of social policies (liberal, socio-democratic conservative model) in the respective countries show a different share of expenditures on social protection of the old age (pension, early retirement pension, other cash benefits and benefits in kind), expressed as % of GDP (Table 3). The main part of social expenditures on the old age are pensions in most countries: 99% in Mexico, Canada and the USA, about 90–85% in France, Italy, Germany, the Czech Republic, Slovakia, more than 80% in Austria and 75% in Sweden. Is some countries, other benefits in kind and services are part of social expenditures on the old age (e.g. Australia, 33%, Sweden, 25%, and Japan, 16%).

Tab. 3: Social protection expenditure on old age [%]

	1990	1995	2000	2005	2006	2007	2008	2009
Australia	3.3	3.9	4.7	4.3	4.7	4.7	4.9	4.9
Austria	8.9	10	10.4	10.8	10.7	10.7	11.0	12.0
Canada	3.8	4.2	3.9	3.7	3.7	3.7	3.8	4.1
Czech Republic	5	5.6	6.8	6.6	6.5	6.6	7	7.8
France	9.2	10.6	10.5	10.9	11	11.1	11.5	12.3
Germany	9.4	7.8	8.6	9.1	8.8	8.5	8.5	9.1
Hungary	..	..	7.0	7.8	8.0	8.4	8.8	9.1
Italy	8.2	9.3	11.1	11.5	11.6	11.7	12.2	13.0
Japan	4	5.2	6.8	8.6	8.7	8.8	9.3	10.4
Mexico	0.4	0.6	0.6	0.9	1	1.1	1.2	1.4
Poland	4.1	7.6	8.5	9.3	9.4	8.7	8.9	9.8
Slovak Republic	..	5.5	5.7	5.7	5.6	5.4	5.2	6.4
Sweden	8.6	9.8	9.1	9.4	9.1	9.0	9.4	10.2
United Kingdom	4.8	5.5	5.5	5.9	5.7	5.7	6.2	6.7
USA	5.2	5.4	5.1	5.3	5.2	5.3	5.5	6.1

Source: own processing according to [20]

Over the years 1990–2009, the social protection expenditure share in the area of pensions in all selected countries demonstrated a slightly increasing tendency, with the exception of Germany, where slight decrease took place. In 2009, France, Austria, Sweden and Japan had largest expenditures in the area of pension policy. Over the years 1990–2009, the most notable increase in expenditures in the area of pension policy was observed mainly in Japan, by 6.4%, in Europe in Poland, Italy, Austria and France, by 5.7%, 4.8%, 3.1% and

3.1%, respectively. It may be assumed that this pertains mainly to legislature and implemented instruments of social policy, in connection with aging of population, and also traditions and customs in the respective countries. However, a very low share of social protection in the area of pensions was observed in non-European countries over the defined period. The lowest share of expenditures on old age was observed in Mexico (around 1%), Australia and Canada (between 3–4%).

The range of public social expenditures varies across countries, depending on the share of public sector, tax burden and redistribution. The amount of expenditures of social protection (on the old age, family policy and unemployment) in selected countries provides basic outline of tendencies of these expenditures, which differ according to adopted concepts in family policy, employment policy and policy of the pension system.

In theory, the amount of the social protection expenditures should be reflected on the achieved level of economic development quantified by the HDI, considered in modern theories of endogenous economic growth to be the most complex indicator. Values of HDI over the observed period in selected countries are provided in Tab. 4.

Tab. 4: Level of economic development quantified by the HDI

	1990	1995	2000	2005	2006	2007	2008	2009
Australia	0.873	0.889	0.906	0.918	0.920	0.922	0.924	0.926
Austria	0.790	0.814	0.839	0.86	0.866	0.870	0.876	0.879
Canada	0.857	0.870	0.879	0.892	0.897	0.900	0.903	0.903
Czech Republic	-	0.788	0.816	0.854	0.858	0.861	0.864	0.863
France	0.777	0.819	0.846	0.869	0.873	0.877	0.879	0.880
Germany	0.795	0.835	0.864	0.895	0.898	0.901	0.902	0.900
Hungary	0.706	0.737	0.775	0.803	0.808	0.809	0.811	0.811
Italy	0.764	0.795	0.825	0.861	0.866	0.869	0.871	0.870
Japan	0.827	0.85	0.868	0.886	0.891	0.894	0.896	0.895
Mexico	0.649	0.674	0.718	0.741	0.748	0.755	0.761	0.762
Poland	-	0.727	0.77	0.791	0.795	0.800	0.804	0.807
Slovak Republic	0.747	0.752	0.779	0.81	0.817	0.825	0.831	0.829
Sweden	0.816	0.855	0.894	0.896	0.898	0.899	0.900	0.898
United Kingdom	0.778	0.816	0.833	0.855	0.853	0.856	0.860	0.860
USA	0.870	0.883	0.897	0.902	0.904	0.905	0.907	0.906

Source: own processing according to [12]

Based on the Pearson correlation coefficient, also mutual relations between selected types of social protection expenditures (in the area of family policy, on unemployment and old age) and the achieved level of economic development – the HDI were analysed (see Tab. 5).

Over the years 1990–2009, based on the Pearson correlation coefficient, a strong linear dependence was proven in the extent of social protection expenditures on family policy, and the HDI in Australia, Canada, Japan, the USA and Mexico. European countries to prove a strong linear dependence of the extent of social protection expenditures in the area of family policy, and the HDI, were France, Hungary, Italy and the UK. The higher social protection expenditures in the area of family policy is, the higher the HDI in these countries is.

A strong indirect linear dependence between the extent of social protection expenditures in the area of family policy, and the HDI, can be spotted in Sweden and Slovakia. It thus applies

Tab. 5: Pearson's correlation coefficient of observed types of social protection expenditures and HDI index for individual countries

	Family policy	Employment policy	Old-age pension policy
Australia	0.72	-0.93	0.93
Austria	-0.11	-0.13	0.91
Canada	0.90	-0.81	-0.26
Czech Republic	-0.58	0.53	0.69
France	0.94	-0.64	0.88
Germany	0.34	0.72	-0.06
Hungary	0.72	-0.48	0.87
Italy	0.92	-0.22	0.95
Japan	0.95	0.08	0.97
Mexico	0.99	-	0.91
Poland	-0.23	-0.99	0.86
Slovak Republic	-0.87	-0.01	0.11
Sweden	-0.86	-0.33	0.37
United Kingdom	0.95	-0.71	0.84
USA	0.97	0.14	0.34

Source: own processing

that the higher the social-security expenditures on family policy in these countries is, the lower the HDI over the observed years. By contrast, from the European countries, mainly Austria and Poland showed a weak indirect linear dependence between the extent of social protection expenditures on family policy, and the HDI.

In European countries, a strong direct linear dependence of the extent of social protection expenditures on unemployment, and the HDI, can be traced in Germany, and a strong indirect linear dependence in Poland and the United Kingdom. In non-European countries, a strong indirect linear dependence of these indicators was observed in Australia and Canada. By contrast, in Austria, Italy, the USA or Japan a very weak dependence between the extent of social protection expenditures on family policy and the HDI.

The mutual relation between the extent of social protection expenditures on old age and the HDI over the observed period proves a strong direct linear dependence in the majority of countries. The exceptions, however, are Canada, Germany and Slovakia are the exception, where a low linear dependence between social protection expenditures on old age, and the HDI was proven. However, in Sweden and the USA, a moderate direct linear dependence was proven between the indicators.

The relation between the extent of selected types of social protection expenditures and the achieved level of economic development is arrived at through the Pearson correlation coefficient for all selected countries summarizes Tab. 6.

In the selected sampling countries, over the years 1990–2009, the Pearson correlation coefficient demonstrates weak linear dependence between social protection expenditures and the achieved level of economic development in the case of:

- the extent of social protection expenditures on family and the HDI in 1995,
- the extent of social protection expenditures on unemployment and the HDI in 2005, 2006 and 2009,
- social protection expenditures on old age and the HDI over 2005–2009.

On the basis of the Pearson correlation coefficient, a weak link between the extent of social protection expenditures in the area of family policy and the HDI in 1995, and as also the determination coefficient demonstrates, there is 7.3% mutual influence, and 92.7% influence by other factors.

Tab. 6: Correlation of observed types of social protection expenditure and the HDI in time – selected countries

The sphere of social policy	1990	1995	2000	2005	2006	2007	2008	2009
Family policy	0.13	0.27	0.16	0.16	0.09	0.08	0.14	0.09
Employment policy	0.07	0.11	0.16	0.25	0.25	0.19	0.21	0.29
Policy of old-age pensions	0.15	0.22	0.22	0.25	0.25	0.25	0.25	0.24

Source: own processing

In the selected sampling countries, a weak correlation is also notable between the extent of social protection expenditures in the area of employment policy and the HDI in 2005 and 2006, when the determination coefficient equals 6.25%. These indicators show a 6.25% mutual influence, and 93.75% influence by other factors. In 2009 as well, a weak correlation between these indicators was proven according to the Pearson correlation coefficient of 0.29 with the determination coefficient of 8.4%.

The correlation relation between the social protection expenditures on old age and the HDI over the years 2005–2009 proved a weak correlation. The determination coefficient shows that over the years 2005–2008, there was 6.25% mutual influence, and 93.75% influence by other factors. A link even weaker was proved in the year 2009, when there was just 5.3% mutual influence between these indicators. HDI being a complex index, we realise methodological restrictions of the dependence of its values on observed types of social-protection expenditures. Distribution of the index and testing of dependence of its parts related to social-protection expenditures may continue further in future, or may be confirmed through the results of the presented research.

Conclusions

In developed countries, expenditures connected with fulfilling the function of redistribution currently represent on average one half of all public expenditures, and their extent is increasing. The question of compromise between efficiency and equity, redistribution poses, is being increasingly discussed in not only economic and social, but also political terms. The general theoretical view on the solution of this issue, presented by the neoclassical school of welfare economics, encounters numerous methodological problems (definition of the function of social welfare, interpersonal comparison of individual well-being) that hamper the attempts to find a proper response. The balance between efficiency and equity also permeates into the realisation of social policy and achieved results of economic policy, with the aim to define an optimal extent and character of the processes of redistribution. That is achievable by defining those areas of social protection where public expenditures make a positive influence on the quality of life in a society. The empirical study reacts to this issue, providing a solution of the research question to the relation between the extent of selected types of social protection expenditures (on family, old age and unemployment) and achieved level of economic development through the HDI. The presence of the relation is statistically tested on the sample of 15 countries of global economy, differing in the achieved level of economic development and the extent and character of governmental redistribution. In most selected countries, the expenditures on social protection in the area of family policy and on old age had a positive influence on the level of economic development calculated through the HDI; by contrast, the expenditures on unemployment had a rather negative influence on the economic development. A high level of heterogeneity of selected countries with respect to the observed aspects proves a markedly different extent and nature of redistribution processes. The findings of the research should therefore be analysed more deeply through the redistribution theory of defined compromise "trade off" between efficiency and equity. The compromise in each country depends on the character of the subparts and the models of social policy. From our perspective, these are models of family policy (liberal, social-market, universalistic), labour market policy (scandinavian model, liberal model, consensual corporate democracy

model) and concepts of pension policy (presented by liberal, socio-democratic and conservative model of social policy).

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References

[1] BAILEY, S.J. *Public Sector Economics*. 1st ed. London: Macmillan, 1995. ISBN 978-0333598016.

[2] BALDOCK, J., MITTON, L., MANNING, N., VICKERSTAFF, S. *Social Policy*. 4th ed. Oxford: University Press, 2012. ISBN 978-0199570843.

[3] BENTHAM, J. *An Introduction to the Principles of Morals and Legislation* [online]. Batoche Books, Kitchener, 2000 [cit. 2013-08-28]. 248 p. Available from: http://socserv.mcmaster.ca/econ/ugcm/3ll3/bentham/morals.pdf.

[4] BLOME, A., KECK, W., ALBER, J. *Family and the Welfare State in Europe*. 1st ed. Cheltenham: Edward Elgar Publishing Ltd, 2009. ISBN 978-1-84844-479-9.

[5] COSTANTINI, V., MONNI, S. Environment, human development and economic growth. *Ecological Economics.* 2008, Vol. 4, Iss. 64, pp. 867-880. ISSN 0921-8009.

[6] CULLIS, J., JONES, P. *Public Finance and Public Choice*. 1st ed. London: McGraw-Hill, 1992. ISBN 0-07-7070400-9.

[7] DINIZ, F., SEQUEIRA, T.A. Social and Economic Development Index. NUTS Ranking in Portugal. *American Journal of Economics.* 2012, Vol. 2, Iss. 7, pp. 146-163. ISSN 2166-496X.

[8] *ESSPROS Manual and user guidelines The European System of integrated Social Protection Statistics* (ESSPROS). Luxembourg: Publications Office of the European Union, 2012. 207 p. ISBN 978-92-79-24751-4.

[9] FARNSWORTH, K., IRVING, Z. *Social policy in challenging times. Economic crisis and welfare systems.* 1st ed. Bristol: Policy Press University of Bristol, 2011. ISBN 978-1847428271.

[10] GAYE, A. *Contribution to Beyond GDP* online. UNDP Human Development Report Office, 2011 [cit. 2014-01-20]. Available from: http://www.beyond-gdp.eu/download/factsheets/HumanDevelopment_Index.pdf.

[11] HOREHÁJOVÁ, M., MARASOVÁ, J. The Institutional Factors of the Corporate Social Responsibility Development in the Central European. *E+M Ekonomie a Management*. 2008, Vol. 11, Iss. 2, pp. 58-64. ISSN 1212-3609.

[12] *Human Development Report 2013* [online]. New York: United Nations Development Programme, 2013 [cit. 2014-01-20]. 216 p. (PDF). Avalible from: http://hdr.undp.org/en/media/HDR_2013_EN_complete.pdf. ISBN 978-92-1-126340-4.

[13] IMMERVOLL, H., RICHARDSON, L. Redistribution Policy and Inequality Reduction in OECD Countries: What Has Changed in Two Decades? *OECD Social, Employment and Migration Working Papers* [online]. OECD Publishing, 2011. No. 122 [cit. 2014-01-20]. 97 p. (PDF). Available from: http://www.oecd-ilibrary.org/docserver/download/5kg5dlkhjq0x.pdf?expires=1391967003&id=id&accname=guest&checksum=1B1AF37B7795933DD 332564EFE3AA2CA.

[14] KENNETT, P. *Comparative Social Policy. Theory and research*. 1st ed. Buckingham: Open University Press, 2001. ISBN 0-335-20123-7.

[15] KUVÍKOVÁ, H., VACEKOVÁ, G. Diversification of financial sources in non-profit organisations. *E+M Ekonomie a Management*. 2009, Vol. 12, Iss. 4, pp. 84-96. ISSN 1212-3609.

[16] LEVIN, J.A., FOX, J.A., FORDE, D.R. *Elementary Statistics in Social Research: International Edition*. 12th ed. Pearson, 2013. ISBN 978-0133079548.

[17] LISTER, R. *Understanding theories and concepts in social policy.* 1st ed. Bristol: Policy Press University of Bristol, 2010. ISBN 978-1861347930.

[18] LYNCH, S.M. *Using Statistics in Social Research*. 1st ed. New York: Springer, 2013. ISBN 978-1-4614-8572-8.

[19] NEMEC, J., ŠPAČEK, D., SUWAJ, P., MODRZEJEWSKI, A. Public Management as a University Discipline in New European Union Member States: The Central European case. *Public Management Review*. 2012, Vol. 14, Iss. 8, pp. 1087-1108. ISSN 1471-9037.

[20] OECD StatExtracts 2013 [online]. OECD, c2013 [cit. 2014-01-20]. Available from: http://stats.oecd.org/Index.aspx?DataSetCode=SOCX_AGG.

[21] OCHRANA, F., NEKOLA, M. Economic evaluation of public programs. *Ekonomický časopis.* 2009, Vol. 57, Iss. 5, pp. 458-474. ISSN 0013-3035.

[22] PESTIEAU, P. *The Welfare State in the European Union: Economic and Social Perspectives*. 1st ed. Oxford: Oxford University Press, 2006. ISBN 0-19-926102-4.

[23] RANIS, G. *Human Development and Economic Growth* online. Yale: Yale University Economic Growth Center. Discussion Paper. 2004, No. 887 cit. 2013-09-01. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=551662.
[24] ROGERS, J. The Swedish Welfare State: Yesterday, Today and Tomorrow. In: JENSEN, H. *The Welfare State, Past, Present, Future.* 4th ed. Pisa: Edizoni Plus University di Pisa, 2002. 221 p. ISBN 978-8884920331.
[25] SARACENO, C. *Families, Ageing and Social Policy.* 1st ed. Cheltenham: Edward Elgar Publishing Ltd, 2008. ISBN 978-1-84720-648-0.
[26] SAUNDERS, P. Recent trends in the Size and Growth of Government in OECD Countries. In: GEMMELL, N. *The growth of the Public Sector*. 1st ed. London: Macmillan & Co Ltd, 1993. 288 p. 978-1-85278-525-3.
[27] URAMOVÁ, M., KOŽIAK, R. Regional disparities in Slovakia from the Aspect of Average Nominal Wage. *E+M Ekonomie a Management*. 2008, Vol. 11, Iss. 2, pp. 6–17. ISSN 1212-3609.
[28] WONNACOTT, T., WONNACOTT, R. *Introductory Statistics for Business and Economics.* 4th ed. Wiley, 1990. ISBN 978-0-471-61517-0.

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Abstract

THE ISSUE OF INCOME REDISTRIBUTION

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The issue of trade off efficiency and equity, which is represented by income redistribution, becomes increasingly debated not only in economic and social, but also in political dimension. Solution of this trade-off is virtually projected into the implementation of social policy and results achieved in macro economics policy, with the goal to define the optimal scope and character of the income redistribution processes. The submitted empirical study responds to this problem through the solution of research question concerning the existence of a relationship between the extent of selected classes of social protection expenditure (expenditure on policy of family, old age and unemployment) and the achieved level of economics development, quantified by Human Development Index (HDI). The existence of this relationship is statistically tested in the sample of 15 countries of the world economy. The research sample is heterogeneous in relation to the analysed indicators and it concerns countries with a different attained level of economics development and income redistribution policy. In most surveyed countries, based on the results of quantitative analysis was confirmed the impact of social protection expenditure on the reached level of economic development. In the area of family policy and old-age pensions this impact was positive and in the area of employment policy this impact was negative. A high level of heterogeneity of selected countries with respect to the observed aspects proves a markedly different extent and nature of redistribution processes. The findings of the research should therefore be analysed more deeply through the redistribution theory of defined compromise "trade off" between efficiency and equity. The compromise in each country depends on the character of the subparts and the models of social policy. From our perspective, these are models of family policy (liberal, social-market, universalistic), labour market policy (scandinavian, liberal and consensual corporate democracy model) and concepts of pension policy (presented by liberal, socio-democratic and conservative model of social policy). The amount of expenditures of social protection (on the old age, family policy and unemployment) in selected countries provides basic outline of tendencies of these expenditures, which differ according to adopted concepts in family policy, employment policy and policy of the pension system.

Key Words: *Redistribution, efficiency, equity, social protection expenditure, economics development.*

JEL Classification*: H5, I38.*

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DETERMINANTS OF PUBLIC EXPENDITURES FOR MEDICINAL PRODUCTS IN NON HOSPITAL CONSUMPTION IN SLOVENIA

Romana Kajdiž, Štefan Bojnec

Introduction

With an aging of the population [2], the population's needs for health services have increased in the European Union (EU-27) as well as in Slovenia. Because of this increases the burden on the country's local public health services and care have increased. The policy response is to save or reduce their operating costs. These policy measures include the rational use of medicinal products and public procurement of cheaper medicinal products. They [1] noted that the expenditures on medicinal products have increased within the EU member states, and therefore argue that the market regulation and pricing of drugs and reimbursement of medicinal products is an important tool to control public spending for medicinal products.

The government with legislation and economic policy measures seek to reduce and to have under control public spending for medicinal products. The purpose of the price regulation system of medicinal products is to reduce public expenditures for pharmaceutical products that are charged by the health insurers and are aimed for finding the optimum balance between maintaining the access to essential medicinal products and the rational use of public funds for medicinal products. The price for medicinal products is only one of the essential factors for the public expenditures. [9], [10]

During the past decades, several EU countries, as well as some other countries (e.g. New Zealand, Australia, Canada and South Korea) ([7], [17]), have implemented various forms of price regulation. The aim of the price regulation for medicinal products is to control the costs and the health expenditures for prescription of drugs. Authors [6] and [3] believe that price regulation is one of the most important tools by which economic policy measures can be used to control and limit the costs of medicinal products. The growth of the public expenditures for medicinal products is the one of the influencing factors for the increase in public spending in health care in most developed countries. To limit the growth of expenditures for medicinal products the competent authorities, particularly in EU-27, initiated regulatory measures, which attempt to influence to the market developments, especially on the supply side [12]. EU countries have different national pharmaceutical systems, not only because of different historical, political, legal and economic trends, but also because of the ways in which they finance the health care systems [18]. These countries are facing the same challenges of how to provide the population with affordable access to medicinal products, with limited available public resources [11]. Over the past ten years, average spending per capita on medicinal products in EU countries has risen by almost 50% in real terms. The evidence for OECD countries suggests considerable variation in medicinal products spending, reflecting differences in volume, structure of consumption and pharmaceutical pricing policies [14].

In this article we aim to establish the association between the regulated wholesale prices of medicinal products and the public expenditures for medicinal products. The public expenditures on medicinal products in the regression model are specified with emphasis on the regulated wholesale prices of medicinal products.

1. Health Care System for Medicinal Products in Non Hospital Consumption in Slovenia

A linear increase in consumption of medicinal products in Slovenia during the recent years has been determined by a continuous increase medicinal products treatment of an aging population, an increased detection of chronic diseases and complex therapeutic guidelines [5]. In Slovenia there has been prescribing the number of new, substantially more expensive medicinal products for a similar or an entirely new medical indication. Like in other developed countries, the Slovenian population is more and more informed about medical patients' treatments. Therefore, this has demanded more public funds for consumption of medicinal products, which have been prescribed by the medical doctors on outpatient prescription (Rp). Those reasons have been leading to a rising the public expenditures for medicinal products in the recent years in Slovenia. At the same time they have caused a debate about the economic efficiency of the public health system. Therefore, the spending of the public funds and the price regulation system for medicinal products, they have increasingly been under a scrutiny of government policy. Legislation, regulatory and economic policy measures have been used in Slovenia at aiming to reduce and control public spending on medicinal products.

Each medicinal product that is present in the Slovenian market must have valid marketing authorization and should have set a price. Medicinal products which are financed from public funds should have regulated wholesale prices in accordance with applicable law. Medicinal products which compete for entry on the list of medicinal products that are wholly or partially financed by public funds covered by the compulsory and supplementary health insurance, they should have first formed the wholesale price in accordance with the applicable rules for the design and pricing of medicinal products. The wholesale price is determined by comparing the basket of reference medicinal product prices or the reference price or international or an external reference price. These comparative countries are Germany, France and Austria, which have replaced Italy in 2007. The system of the mutual interchangeable medicinal products (MZZ) in Slovenia is used to regulate prices of medicinal products namely internal reference prices. This system is applied only to some groups of medicinal products organized in clusters having the same active principle, strength and formulation. The MZZ list with maximum recognized value (MZZ z NPV) determinates the maximum value that is covered by the compulsory public health insurance. This is in responsibility of the Standing Committee for Medicinal Products. The additional decisions for ranging the medicinal products in the lists have been in the responsibility of the Public Health Care Service of Slovenia. Medicinal products can be classified in the positive list, the intermediate list, by limiting the prescription laid down by the Public Health Care Service of Slovenia, or not classified that are on a negative list [15]. Maximum recognized value (NPV) is the price of the medicinal product, which is covered by the Public Health Care Service of Slovenia in accordance with the classification of medicinal product on the lists: at 75% for medicinal products at the positive list, at the 25% for medicinal products at the intermediate list, and at 100% for specific examples. In 2009, there have been made some changes. The NPV is the price of the product value for each medicinal product covered by the Public Health Care Service of Slovenia in accordance with the classification of the medicinal products on the lists: at 100% for the positive list P100, at 75% for the positive list P75 and at 10% for the intermediate list. If the price for medicinal products is higher than the NPV, the patients need to pay the difference between the actual cost of medicinal product and the set NPV. The final price of each medicinal product also increases for the cost of margins, which are charged by the dispensing pharmacy. The costs of pharmacy services is not tied to the price of medicinal products, but is fixed. It is defined in the sectoral agreement for pharmaceutical activity.

The health care and health insurance legislation in Slovenia provides compulsory and voluntary health insurance, which affects the manner of payments of costs for medicinal products. The burden of compulsory health insurance may be classified only for prescribed medicines and foods for special purposes. The compulsory health insurance covers at least 75% of the value of the positive list and a maximum of 50% for the intermediate medicinal product from the list.

The MZZ list entered into force in Slovenia in November 2003. The initial list was compiled by the competent authority for medicinal products [15]. Since 2007, the Public Agency of the Republic of Slovenia for Medicinal Products and Medical Devices has updated this list. The system operates on a comparison of the scheduled medicinal products with the same non-proprietary name or the same substance, which corresponds to a number of brand names of medicinal products with different prices. At least one of the medicinal products with the same non-proprietary name and comparable packaging must be within the NPV. The introduction of the MZZ has brought some positive economic effects from a more rational prescribing of medicinal products. These has occurred owing from a larger share of a prescription of parallel medicinal products with the lower price, and owing from the lowering of prices of certain medicinal products from manufacturers just before and during the period following the implementation of the MZZ by setting the NPV. The effects were most noticeable in the first years after the introduction of the system [15].

In Slovenia the ratio between the total costs for medicinal products and the costs of medicinal products, which were covered by the Public Health Care Service of Slovenia, has changed over the years. In 2000, 79.2% of all costs for medicinal products were covered by the Public Health Care Service of Slovenia, while 63.8% in 2010 [15]. The total costs for medicinal products and the share covered by the Public Health Care Service of Slovenia depend largely on the classification of medicinal products on one of the lists and on prices of medicinal products.

The study of developments of regulated wholesale prices of medicinal products in Slovenia in the period from 2003 to 2010 showed that the regulated wholesale prices of medicinal products, which were publicly funded and were prescribed on an outpatient Rp, have been reduced over the analysed period. The price regulation system of medicinal products in Slovenia has become an important mechanism for the control of public spending on pharmaceuticals. [9], [10]

2. Data Used in the Study

In this study we used data on the consumption of medicinal products, which are published on the website of the Public Health Care Service of Slovenia and ranged them into the balanced panel data, which were selected based on the following criteria: medicinal products, data available in all studied periods, and should have regulated wholesale price, which financed by public funds. We included the following variables: public expenditures on medicinal products prescribed in the outpatient Rp covered by the compulsory health insurance, the number of the Rp, the number of boxes of medicinal products prescribed on the Rp, wholesale prices of medicinal products and lists on which the medicinal products were classified (P100, P75, Q25 and Q10) . Data on the number of the Rp, the number of boxes of medicinal products prescribed on the Rp and the value of medicinal products issued on the Rp and covered by the compulsory health insurance in Slovenia were obtained on the website of the Public Health Care Service of Slovenia. Data on wholesale prices of medicinal products and classification of them on the lists of medicinal products that are wholly or partly funded from public resources and information on the percentage of the value of wholesale prices and the classification were obtained on the basis of data from the Public Health Care Service of Slovenia. The study analyzed 758 medicinal products regulated prices, financed from public funds in the years 2003–2010. These data are reported in the nominal values. To obtain their real values over the analysed years, the nominal values were deflated by the consumer price index (CPI) with the base year. The CPI deflators are obtained from the Statistical Office of the Republic of Slovenia. They are used to obtain the real price values for medicinal products.

3. Methodology

We analyze the relationship between the dependent variable and independent explanatory variables by using the multivariate regression analysis in order to estimate the model parameters and the statistical significance of the model.

The starting point of the empirical analysis is the correlation analysis in order to examine the degree of correlation between the pairs of the analysed individual variables. Finally, the regression analysis of the panel data by employing the ordinary least square method is

used to determine the relationship between the public expenditures on medicinal products and the wholesale price of medicinal products. The regression analysis for the public expenditures on outpatient medicinal products prescribed on the Rp, which are covered by the Public Health Care Service of Slovenia as the dependent variable is specified by using the following explanatory variables: the number of Rp, the number of boxes of medicinal products prescribed on the Rp, the wholesale price of medicinal products and four dummy variables for the lists on which the medicinal product is classified (P100, P75, Q25 and Q10). Each dummy variable takes the value 1 if the medicinal product is classified at the appropriate list and 0 otherwise. Nominal values of the variables are deflated by the CPI. The regression model is estimated in natural logarithms, which means that the regression coefficients at the same time represent the coefficients of elasticity.

The null hypothesis assumes that public expenditures for medicinal products, prescriptions covered by the compulsory health insurance are not associated with the wholesale price of medicinal products, the number of boxes of medicinal products prescribed per prescription or the number of prescriptions of recipes and the list at which the medicinal product is classified (H0: $\theta = 0$). The alternative hypothesis assumes that public expenditures on medicinal products, prescriptions covered by the compulsory health insurance are associated with the wholesale price of medicinal products, the number of boxes of medicinal products prescribed per prescription or the number of prescriptions of recipes and the list at which the medicinal product is classified (H1: $\theta \neq 0$).

4. Empirical Results

The correlation analysis showed that there is a high positive correlation between the public expenditures on medicinal products and the number of Rp or the number of boxes prescribed on the Rp, and there is a positive, but relatively low correlation between the public expenditures on medicinal products and the wholesale price of medicinal product on one hand and the classified list of medicinal products on the other (Table 1).

The regression analysis confirmed that the public expenditures for medicinal product are positively associated with the number of the Rp and the number of boxes prescribed on the Rp, the wholesale price of medicinal product, and the lists on which medicinal products are classified.

Tab. 1: Correlation coefficients and regressions for public expenditures for medicinal products in non hospital consumption in Slovenia

Dependent variable: public expenditures on medicinal products	Correlation coefficients	Regression (1)	Regression (2)
Explanatory variables:			
Wholesale price	0.223***	0.866***	0.893***
Number of Rp	0.661***	0.932***	
Number of boxes on the Rp	0.670***		0.971***
Positive list 100	0.031**	1.931***	1.889***
Positive list 75	0.207**	1.510***	1.667***
Intermediate list 25	-0.106***	0.978***	1.051***
N	6,064	6,064	6,064
Adjusted R^2		0.896	0.937
F-test		10,446.3	18,096.9

Source: own

Note: *** p<0.001; ** p<0.05. Public expenditures on medicinal products, the wholesale price, the number of the Rp and the number of boxes on the Rp are expressed in natural logarithms.

5. Discussion

The correlation and regression analysis confirmed a positive association between the wholesale price of medicinal product and the public expenditures for medicinal products. There was also a positive association between the public expenditures for medicinal products and the number of the Rp or the number of boxes required on the Rp. The explanatory variables included in the regression model explained 94% of the variability of the public expenditures for medicinal product. The set dummy variables for the list classification (P100, P75 and Q25) were positively associated with the public expenditures for medicinal products. Elasticity coefficients indicate that an increase the number of the Rp for 1% leads to an increase in the public expenditures for medicinal products by 0.932%. The increase in the number of boxes of medicinal products prescribed on the Rp by 1% leads to an increase in the public expenditures for medicinal products by 0.971%. The increase in the wholesale price of medicinal products prescribed on the Rp by 1% leads to an increase in the public expenditures for medicinal products by 0.866% or 0.893%. The previous analysis ([9] and [10]) confirmed that the wholesale prices of medicinal products have declined during the price regulation system. The empirical results confirmed that the public expenditures for medicinal products issued on the Rp, which are covered by the compulsory health insurance, are related to the number of the Rp or the number of boxes prescribed on the Rp and the wholesale price of medicinal products and the lists to which the medicinal products are classified. The public expenditures for medicinal products are affected by the number of prescribed medicinal products, which are issued by the Rp and the number of boxes of medicinal product, which are prescribed on the Rp, and the developments of the regulated wholesale prices for medicinal products.

The empirical analysis confirmed the alternative H1 hypothesis, which says that there is a positive association of the public expenditures for medicinal products with the number of boxes of medicinal product, which prescribed on the Rp, the number of the Rp prescriptions, the wholesale price of medicinal products and the lists to which the medicinal product is classified.

The regulated wholesale price affects the public expenditures for medicinal products, but on the public expenditures for medicinal products has a significant positive impact also the number of the Rp or the number of boxes of medicinal products, which are prescribed on the Rp. Effective, safe and quality treatment of patients with medicinal products is not proportional to the number of medicinal products that each patient receives. The aim of pharmacological treatment is the best possible quality of life of patients. Safe and effective quality treatment and consequently cost-effective medical treatment depends largely on a correct assessment of a medical doctor regarding medical conditions for the individual patient that should be treated with medicinal products. Crucial is the responsible prescribing of medicinal products on the RP. The consumption of medicinal products in Slovenia measured in the defined daily doses in the last ten years increased, while the number of persons, who received this medicine, has not significantly increased. This suggests that the same people received more medicinal products and the consumption of medicinal products per beneficiary has increased over time. There is an increased risk of adverse interaction and negative reaction on medicinal products use, and more difficult is to manage costs for medicinal products in a sustainable way vis-à-vis budgetary limitations. The polipharmacy – the co-administration of five or more medicinal products simultaneously – is in the exceptional growth, which to some extent also leads to increasing health damages and additional economic costs. The responsible prescribing of medicinal products, which requires consideration of medical and economic aspects of prescription of medicinal products, is of a substantial relevance. The prescribing of medicinal products should be derived from the medicinal findings of which medicinal products are really necessary to treat patients and at the same time to reduce irrational prescribing. For more responsible and proper use of medicinal products it is necessary to inform and educate patients in order to consider rational use and to prevent irrational behaviour which requires prescription of medicinal products without adequate medical treatment.

Conclusions

The regression analysis has confirmed that the public expenditures for medicinal products were a positively associated with the regulated wholesale prices of medicinal products. This implies the decrease in the wholesale prices of medicinal products has caused the decrease in the public spending for medicinal products. The results of the regression analysis confirmed the relationship between the lists on which the medicinal product is classified and the public expenditures for medicinal products. The public expenditures for medicinal products were also significantly determined by the number of prescribed Rp and the number of boxes of medicinal products on the Rp prescription. In the regression model included variables explained a high percentage of the public expenditures for medicinal products. To a lesser extent the regression results are affected by some other factors, which were not specified in regression model such as value-added tax and pharmacy services. The regulation of the wholesale prices for medicinal products and encouraging more conservative prescribing could play an important role in management of public spending for medicinal products [16]. The consumption of medicinal products in Slovenia has increased over time. New medicinal products and new areas of medical treatments, higher prescribed doses of medicinal products, aging of the population and the related polipharmacy, have rapidly increased costs for use of medicinal products. They go beyond the sustainable financial ability of the Public Health Care Service of Slovenia. This situation is similar to the public health systems in most of developed countries. Therefore, to reduce costs and public health expenditures is a challenging issue for both health and overall economic and budgetary policy.

They [4] noted that in the early 1990s, most of governments in Europe decided to implement a mixture of different health policies and policies towards consumption of medicinal products, which are financed from the public funds. These policies focus on the price regulation for medicinal products or on the prescribed amount of medication or a combination of both. The practical experiences confirmed the crucial importance of mix of fair pricing policy and regulation quantities for medicinal products. As the regression analysis confirmed the public financing expenses were significantly positively associated with the number of Rp and the number of boxes prescribed on the Rp. This reflects the importance of the pricing policy and regulation quantities for medicinal products, which were intended for consumption financed by the public expenditures.

Rational prescribing of medicinal products and their rational use in accordance with the medical instructions are the factors that could affect the costs and public expenditures for medicinal products without reductions of the rights of insured for medical products. Rational prescribing of medicinal products could not be considered as a measure for limiting the access to medicinal products, but rather the appropriate way of utilization of limited available public resources for medicinal products. The monitoring of the expenditures for medicinal products in Slovenia has included regulated pricing, scheduling of medicinal products on the lists (the system of the MZZ with NPV and medicinal products with limited prescription), education and information for medical doctors, pharmacists and users on the appropriate and rational management in the use of medicinal products. The aim in Slovenia has been to reduce the public expenditures for medicinal products. This has been included in the regime of medical treatments, which allows the inclusion of new and more effective medicinal products in the health system.

The article does not address the issues of consumption of medicinal products, which were used in hospitals ([8] and [13]). The reason for this lies in a fact that the observed period was not accompanied by data on the use of medicinal products in the hospitals. The prices of medicinal products in the hospitals were determined by the similar procedure as the prices of medicinal products with the Rp prescription. The consumption of medicinal products in hospitals is an issue future research.

References

[1] ARTS, D., HABL, C., ROSIAN, I., VOGLER, S. Pharmaceutical pricing and reimbursement information (PPPI): a European Union project. *Italian Journal of Public Health*. 2006, Vol. 3, Iss. 1, pp. 213-234. ISSN 1723-7815.

[2] ČEPAR, Ž. *Visokošolsko izobraževanje v Sloveniji: analiza povpraševanja*. Koper: Založba Univerze na Primorskem, 2010. ISBN 978-961-6832-01-4.
[3] DICKSON, M., REDWOOD, H. Pharmaceutical reference prices: How do they work in practice? *Pharmacoeconomics.* 1998, Vol. 14, Iss. 5, pp. 471-479. ISSN 1170-7690.
[4] ESPIN, J., ROVIRA, J. *External Price Referencing. WHO/HAI project on medicines prices and availability*. Policy paper, 2010.
[5] FÜRST, J., SAMALUK, V. Predpisovanje zdravil v letu 2006. *Zdravstveni Vestnik.* 2007, Vol. 76, pp. 487-489. ISSN 0350-0063.
[6] GIULIANI, G., SELKE, G., GARATTINI, L. The German experience in reference pricing. *Health Policy*. 1998, Vol. 44, Iss. 1, pp. 73-85. ISSN 0168-8510.
[7] LEE, I-H., BLOOR, K., HEWITT, C., MAYNARD, A. The effects of new pricing and copayment schemes for pharmaceuticals in South Korea. *Health Policy.* 2012, Vol. 104, Iss. 1, pp. 40-49. ISSN 0168-8510.
[8] JÁNOŠÍKOVÁ, L. Reduction of a hospital network as a multiple criteria optimisation problem. *E+M Ekonomie a Management*. 2009, Vol. 12, Iss. 3, pp. 50-57. ISSN 1212-3609.
[9] KAJDIŽ, R., BOJNEC, Š. Ali regulacija in kritje cen zdravil vplivata na javne izdatke za zdravila? *Zdravniški vestnik*. 2012, Vol. 81, No. 9, pp. 618-625. ISSN 1581-0224.
[10] KAJDIŽ, R., BOJNEC, Š. Učinki sistema referenčnih cen na oblikovanje cen zdravil. *Management.* 2010, Vol. 5, Iss. 1, pp. 53-67. ISSN 1854-4231.
[11] LEOPOLD, C., VOGLER, S., MANTEL-TEEUWISSE, A.K., DE JONCHEERE, K., LEUFKENS, H.G.M., LAING, R. Differences in external price referencing in Europe – A descriptive overview. *Health Policy.* 2012, Vol. 104, Iss. 1, pp. 50-60. ISSN 0168-8510.
[12] MORENO-TORRES, I., PUIG-JUNOY, J., RAYA, J.M. The impact of repeated cost containment policies on pharmaceutical expenditure: experience in Spain. *European Journal of Health Economics*. 2010, Vol. 12, Iss. 6, pp. 563-573. ISSN 1618-7598.
[13] NEMEC, J., MERIČKOVÁ, B., ŠTRANG-FELDOVÁ, J. The ownership form of hospitals from the viewpoints of economic theory and Slovak practice. *E+M Ekonomie a Management*. 2010, Vol. 13, Iss. 2, pp. 19-31. ISSN 1212-3609.
[14] OECD. *Health at a Glance: Europe 2010, OECD publishing*. Paris: Organisation for Economic Cooperation and Development, 2010. 130 p. Available also from: http://dx.doi.org/10.1787/health_glance-2010-en. ISBN 978-92-64-09031-6.
[15] PEČAR-ČAD, S., HRIBOVŠEK, T. *Ambulantno predpisovanje zdravil v Sloveniji po ATC klasifikaciji v letu 2010*. Ljubljana: Inštitut za varovanje zdravja Republike Slovenije, 2011.
[16] SCIFF, G.D., GALANTER, W.L. Promoting more conservative prescribing. *JAMA*. 2009, Vol. 301, Iss. 89, pp. 865-867. ISSN 1538-3598.
[17] PARK, S.E., LIM, S.H., CHOI, H.W., LEE, S.M., KIM, D.W., YIM, E.Y., KIM, K.H., YI, S.Y. Evaluation on the first 2 years of the positive list system in South Korea. *Health Policy.* 2012, Vol. 104, Iss. 1, pp. 32-39. ISSN 0168-8510.
[18] VOGLER, S., et al. *Pharmaceutical Pricing and Reimbursement Information (PPRI): final report*. Luxembourg: DG Health and Consumer Protection of the European Commission, 2007. Available also from: http://ppri.goeg.at.

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Abstract

DETERMINANTS OF PUBLIC EXPENDITURES FOR MEDICINAL PRODUCTS IN NON HOSPITAL CONSUMPTION IN SLOVENIA

Romana Kajdiž, Štefan Bojnec

The Slovenian government aims to regulate prices for medicinal products to manage and reduce public expenditures for medicinal products. This paper aims to investigate the association between the regulated wholesale prices of medicinal products and the public expenditures for medicinal products, and to estimate regression model for public expenditures for medicinal products in the non hospital consumption. In the empirical research are included 758 regulated prices for medicinal products prescribed by the outpatients' department on a prescription (Rp) during the years 2003–2010, which are financed from public expenditures. The correlation and regression analyses are used in order to establish the association between the regulated wholesale prices for medicinal products and the public expenditures for medicinal products. The correlation analysis confirmed a strong positive correlation of the public expenditures for medicinal products with the number of Rp or the number of boxes on the Rp prescription, a weak correlation with the wholesale prices for medicinal products and with the classification lists of medicinal products. The multiple regression analysis confirmed a positive significant impact of the wholesale price of medicinal products and the number of Rp or the number of boxes on the Rp prescription, on the public expenditures for medicinal products. The research has confirmed the association of the public expenditures for medicinal products with the regulated wholesale prices for medicinal products. It has underlined the importance of the rational prescription and use of medicinal products. The explanatory variables included in the regression model for the public expenditures for medicinal products explained up to 94% of variability in the public expenditures for medicinal products.

Key Words: *Price regulation, medicinal products, prescription management, public expenditures, Slovenia.*

JEL Classification: *H51.*

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MANAGER'S ASSESSMENT OF ORGANIZATIONAL CULTURE

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Introduction

Transformation of totalitarian and centrally regulated society to democratic and free market one initiated, two decades ago, large changes involving all spheres of the society. In the economic area, the transformation to a more efficient market system started, following its deformations which were the result of the forty years of collective ownership and centrally planned economy that had led to lagging economic performance, efficiency and productivity behind developed countries [11]. All the transformations caused changes in organisation business and thus variation in organisation culture.

Organizational culture is considered as an internal variable, distinctive and unique feature of every organization. Therefore, many authors tried to define and explain it, and thus organizational culture is regarded as a set of assumptions [25], rituals and ceremonies [5], managerial practices [10] and shared values [18]. There is also an agreement that strong culture differentiates successful from unsuccessful organizations. They believe that strong culture facilitates coordination and communication and carries a competitive advantage when comparing with other organizations [18].

Organizational culture is a system of shared beliefs and understandings of members of organization which largely determines their mutual actions. In every organization there are values, symbols, rituals, myths, practices that gradually evolve over time [27]. These shared values and experiences largely determine what employees perceive and how they react to their world [26]. According to one of many definitions encountered in literature, culture means perception, since individuals understand organizational culture based on what they see, hear and experience within the organization itself. Second, although individuals may have different social background, different education, or work at different levels, they tend to describe organizational culture in a similar manner. Organizational culture is a descriptive term since it refers to the way its members manage the industrial system, not assuming the employees' affective attitude [22]. Organizational culture – a popular but also a very complex concept – has been identified as an influential factor affecting the successes and failures of organizational change efforts [15]. Especially the effects of organizational culture in IS implementation has brought about a body of studies (e.g. [2], [4], [16], [20], [23], [24], [29]). Recently many studies have been concerned with the part culture plays in achieving total quality through Total Quality Management (TQM) (e.g. [1], [6], [7], [12], [14], [21]).

The basic elements of culture of managerial activities include a series of questions, starting from personal culture, throughout the cultural organization of the workplace, the culture of written and oral communication, behavior towards co-workers, subordinates, illustrating thereby the importance of this matter that contributes to the process of innovation of industrial business systems. Dimensions of organizational culture will influence the process of innovation significantly only when required measures are taken. These specific measures extend the boundaries of regional innovation system in the industry. This policy is aimed at promoting the region due to its industrial sector [13].

Pareek understands the concept as a collection of several interconnected concepts, values, beliefs, norms and attitudes. The values are dispositions directed towards

objectives and activating the staff, while the dimensions are operationalized values in real conditions. According to him, a healthy organizational culture is based on eight "OCTAPACE" dimensions, i.e. **openness, confrontation, trust, authenticity, proactivity, autonomy, collaboration and experimentation** and the concept can be considered as a good and progressive way of building an organization [9].

Research questions at the outset of the study are:

- Which are the dominant values according to manager's assessment of organizational cultures?
- Do the values of organizational culture have any impact on the employees' behavior, i.e. are the dimensions of culture clearly adopted by the employees according to the managers' opinion?
- Do the dimensions of organizational culture differ depending on the type of organization?
- Is there any difference in the assessment of the impact of the dimensions of culture on the employees depending on the level of management?

The main objective of this study is to propose the directions of development of the desired culture and the desired system of organizational values, based on the results and indicators defined by them.

1. Research Methods and Instruments

Organizational culture provides the basis for the definition of desired organizational behavior, and the acceptance of certain values as measured by the dimensions of organizational culture that are the basis of a proactive and successful behavior. The aim of this study is to define the existing dimensions of organizational culture in the studied industrial systems and based on the identified indicators of managerial and organizational measures to direct the organizational culture towards the acceptance and realization of changes in behavior that would contribute to overcoming the problems of transition more quickly on one hand and to more successful business results on the other.

In the period of transition, managers have a crucial role, because by their behavior, knowledge and skills they influence the adoption of the organization's culture and the changes imposed by the business environment. The level of management is divided into four categories:

- The first category consists of executives with the highest authority. In this study, these are the managing director, his deputy, managing director executives for certain functions, company-parts' directors, their deputies and technical directors.
- The second category consists of the heads of departments (or divisions, depending on the organizational structure of the enterprise's specific part) and branch managers.
- The third category consists of the heads of departments and/or divisions and services (depending on the organizational structure of the enterprise's specific part).
- The fourth category consists of front-line executives, who have the most direct contact with employees, i.e. the headmen.

The study sample consisted of 162 managers from eight companies of different ownership structure, activities and business functions in Serbia [17]. The study included managers of all ages. The median-measured average age of managers was 45 (the inter quartile range was 16). The youngest manager was 23, while the oldest was 67. The study included respondents that spent on the managerial position one year, as well as those with extensive knowledge in respect of this job, spending 37 years in managerial positions. The average number of years spent on a leadership position as measured by median was 19 (the inter quartile range was 17).

Considering the respondents' gender, 106 (65.4%) of them were males and 56 (65.4%) were females.

Regarding the level of the managers' position in organizations:

- 17.4% of managers were at a higher level of management (director, deputy, technical director),
- 34.8% of managers were at the intermediate level (head of a sector, branch),
- 25.5% of managers were at a lower level (head of a department, division/service),
- 22.4% of managers were on the lowest level of management (headman).

The Questionnaire on organizational culture was used as the research instrument of the study, which was taken from Pareek and adapted to the linguistic context [9]. It consisted of 40 questions, drafted in the form of statements with possible alternative responds in the form of a four-point scale (1 – not valued in the organization; 2 – fairly valued in the organization; 3 – valued in the organization, 4 – highly valued in the organization). This reduced the possibility of forced choice of respond, enabling a more accurate determination of importance that the respondents attribute to individual claims.

The purpose of this instrument is to measure the correlation of the dimension of organizational culture with four levels of management, and eight cultural subscales which are explained below.

The psychometric properties are shown in Table 1.

Tab. 1: Psychometric properties of the Questionnaire of organizational culture

	Kaiser-Meyer-Olkin measure of sample adequacy	Cronbach's alpha	The 1st main component	
			Characteristic root λ	% of explained variance
Openness	.784	.785	2.701	54.017
Confrontation	.829	.824	3.006	60.116
Trust	.742	.792	2.467	61.682
Authenticity	.581	.513	1.653	41.314
Proactivity	.833	.814	2.922	58.431
Autonomy	.555	.554	1.813	36.269
Collaboration	.692	.602	2.053	41.060
Experimentation	.806	.956	2.719	54.387
The entire questionnire		.956		

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Subscales:

1. Openness: The spontaneous expression of feelings and thoughts and their unreserved sharing.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .785; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .784, and according to the Kaiser's interpretation it is categorized as high. Based on the amount of explained variance of the 1st principal component (54.017%, $\lambda = 2.701$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
2. Confrontation: Facing the problems, instead of avoiding them; in-depth analysis of interpersonal problems; coping with challenges.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .824; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .829, and according to the Kaiser's interpretation it is categorized as high. Based on the amount of explained variance of the 1st principal component (60.116%, $\lambda = 3.006$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.

3. Confidence: Confidentiality regarding the information received from others, instead of their misuse; a sense of security that others will help in case of need and that they will keep mutual obligations and promises.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .792; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .735, and according to the Kaiser's interpretation it is categorized as high. Based on the amount of explained variance of the 1st principal component (61.682%, $\lambda = 2.467$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
4. Authenticity: The harmony between how one feels, speaks and acts; acceptance of his/her own deeds and mistakes; unreserved sharing of feelings.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .513; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .596, and according to the Kaiser's interpretation it is categorized as low. Based on the amount of explained variance of the 1st principal component (41.314%, $\lambda = 1.653$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
5. Proactivity: Initiative; planning in advance and taking preventive measures; calculating trade-offs before taking actions.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .814; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .833, and according to the Kaiser's interpretation it is categorized as high. Based on the amount of explained variance of the 1st principal component (58.431%, $\lambda = 2.922$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
6. Autonomy: Using and giving freedom in planning and acting in the own area; encouraging and respecting individual and working autonomy.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .554; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .555, and according to the Kaiser's interpretation it can be categorized as low. Based on the amount of explained variance of the 1st principal component (36.269%, $\lambda = 1.813$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
7. Collaboration: Providing assistance to others and seeking help from others; team spirit; individuals and groups are working together in solving problems.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .602; the measure of sample representativeness evaluated by means of the KMO measure of sample adequacy is .692, and according to the Kaiser's interpretation it is categorized as average. Based on the amount of explained variance of the 1st principal component (41.060%, $\lambda = 2.053$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.
8. Experiment: the use and promotion of innovation methods in problem solving; the use of feedback to make improvements; a new way of looking at things; encouraging creativity.
   The reliability of the scale evaluated by means of the Cronbach's alpha coefficient is .789; the measure of sample representativeness evaluated by means of the KMO

measure of sample adequacy is .806, and according to the Kaiser's interpretation it is categorized as high. Based on the amount of explained variance of the 1st principal component (54.387%, $\lambda = 2.719$) and the scree chart, this subscale is considered one-dimensional, i.e. it has one subject of measurement and it is homogeneous. Since all items have significant factorial loadings, the construct validity of individual subscales is considered appropriate.

The sample was described by the use of applied statistical analyses: t-test, one-way analysis of variance (ANOVA), Kruskal-Wallis test, Spearman's rank correlation coefficient.

Research hypotheses:

H1 – There are differences between managers of different levels of management regarding their assessment of the impact of dimensions of organizational culture measured by Pareek's instrument;

H2 – There are differences between managers from manufacturing industrial systems and the service sector regarding their assessment of the impact of specific dimensions of organizational culture;

H3 – There are differences between managers of different levels of management regarding their assessment of the contents of organizational culture, and the ownership profile of the organization (state/public-owned industrial systems and systems in private ownership).

2. Results and Discussion

According to the proposed hypothesis that there are differences between managers at different levels of position regarding the perception of impact of organizational culture, the next part of this work represents the analysis of variance, as well as the Scheffe's test which both confirm these differences (Tables 2 and 3).

Tab. 2: Analysis of variance for differences regarding the level of positions in organizations

		Sum of squares	df	Mean square	F	p
openness	Among groups	108.37	3	36.12	7.93	0.00
	Within groups	246.13	54	4.56		
	Total	354.50	57			
confrontation	Among groups	60.46	3	20.15	4.15	0.01
	Within groups	272.28	56	4.86		
	Total	332.73	59			
trust	Among groups	62.36	3	20.79	6.21	0.00
	Within groups	190.79	57	3.35		
	Total	253.15	60			
authenticity	Among groups	33.22	3	11.07	3.80	0.02
	Within groups	157.40	54	2.92		
	Total	190.62	57			
proactivity	Among groups	59.50	3	19.83	4.18	0.01
	Within groups	256.43	54	4.75		
	Total	315.93	57			
autonomy	Among groups	54.51	3	18.17	8.07	0.00
	Within groups	117.05	52	2.25		
	Total	171.55	55			
collaboration	Among groups	64.81	3	21.60	6.39	0.00
	Within groups	179.33	53	3.38		
	Total	244.14	56			

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Tab. 3: Testing the differences between individual groups in organizations by the Scheffe's test (part 1)

Dependent variable	(I) level of position	(J) level of position	Differences M (I-J)	Standard deviation	p
openness	director, deputy, technical director	head of the sector (division), branch	1.91	0.91	0.23
		head of the division, department/service	3.07	0.85	0.01
		headman	3.71	0.79	0.00
	head of the sector (division), branch	head of the division, department/service	1.16	0.85	0.60
		headman	1.81	0.79	0.17
	head of the division, department/service	headman	0.65	0.72	0.85
confrontation	director, deputy, technical director	head of the sector (division), branch	1.73	0.92	0.33
		head of the division, department/service	2.86	0.88	0.02
		headman	2.45	0.81	0.04
	head of the sector (division), branch	head of the division, department/service	1.13	0.85	0.63
		headman	0.73	0.79	0.84
	head of the division, department/service	headman	-0.41	0.74	0.96
trust	director, deputy, technical director	head of the sector (division), branch	0.94	0.76	0.68
		head of the division, department/service	2.61	0.73	0.01
		headman	2.40	0.67	0.01
	head of the sector (division), branch	head of the division, department/service	1.67	0.71	0.15
		headman	1.46	0.65	0.18
	head of the division, department/service	head of the sector (division), branch	-1.67	0.71	0.15
		headman	-0.20	0.61	0.99
authenticity	director, deputy, technical director	head of the sector (division), branch	0.67	0.71	0.83
		head of the division, department/service	1.73	0.68	0.10
		headman	1.90	0.64	0.04
	head of the sector (division), branch	head of the division, department/service	1.07	0.66	0.46
		headman	1.23	0.62	0.28
	head of the division, department/service	headman	0.17	0.58	0.99

Tab. 3: Testing the differences between individual groups in organizations by the Scheffe's test (part 2)

Dependent variable	(I) level of position	(J) level of position	Differences M (I-J)	Standard deviation	p
proactivity	director, deputy, technical director	head of the sector (division), branch	0.98	0.91	0.76
		head of the division, department/service	2.30	0.88	0.09
		headman	2.58	0.81	0.03
	head of the sector (division), branch	head of the division, department/service	1.32	0.86	0.50
		headman	1.61	0.79	0.26
	head of the division, department/service	headman	0.29	0.75	0.99
autonomy	director, deputy, technical director	head of the sector (division), branch	1.23	0.64	0.31
		head of the division, department/service	1.97	0.62	0.03
		headman	2.75	0.58	0.00
	head of the sector (division), branch	head of the division, department/service	0.74	0.59	0.67
		headman	1.52	0.55	0.07
	head of the division, department/service	headman	0.78	0.52	0.53
collaboration	director, deputy, technical director	head of the sector (division), branch	2.36	0.77	0.03
		head of the division, department/service	2.87	0.73	0.00
		headman	2.69	0.70	0.00
	head of the sector (division), branch	head of the division, department/service	0.52	0.71	0.91
		headman	0.34	0.68	0.97
	head of the sector (division), branch	headman	-0.18	0.64	0.99

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Testing the differences between individual groups in organizations by the Scheffe's test has following results:

- Openness ($F (3; 54) = 7.93$, $p \leq 0.05$)
  Scheffe's test showed that openness is more positively valued by managers at the first level of management (director, deputy) than by heads of the departments, divisions/services ($p \leq 0.01$) and by the headmen ($p \leq 0.01$);
- Confrontation ($F (3; 56) = 4.15$, $p \leq 0.01$)
  Scheffe's test showed that confrontation is more positively valued by managers at the first level of management (director, deputy) than by heads of the departments, divisions/services ($p \leq 0.05$) and by the headmen ($p \leq 0.05$);
- Trust ($F (3; 57) = 6.21$, $p \leq 0.01$)
  Scheffe's test showed that trust is more positively valued by managers at the first

level of management (director, deputy) than by heads of the departments, divisions/ /services ($p \leq 0.01$) and by the headmen ($p \leq 0.01$);

- Authenticity ($F (3; 54) = 3.80$, $p \leq 0.05$) Scheffe's test showed that authenticity is more positively valued by managers at the first level of management (director, deputy) than by the headmen ($p \leq 0.05$);
- Proactivity ($F (3; 54) = 4.18$, $p \leq 0.01$) Scheffe's test showed that proactivity is more positively valued by managers at the first level of management (director, deputy) than by the headmen ($p \leq 0.05$);
- Autonomy ($F (3; 52) = 8.07$, $p \leq 0.01$) Scheffe's test showed that autonomy is more positively valued by managers at the first level of management (director, deputy) than by heads of the departments, divisions/services ($p \leq 0.05$) and by the headmen ($p \leq 0.01$); and
- Collaboration ($F (3, 53) = 6.39$, $p \leq 0.01$) Scheffe's test showed that collaboration is more positively valued by managers at the first level of management (director, deputy) than by heads of sectors ($p \leq 0.05$), heads of the departments, divisions/services ($p \leq 0.01$) and by the headmen ($p \leq 0.01$);

The proposed hypothesis that there are differences among managers of different levels of position regarding the perception of the impact of organizational culture is fully confirmed.

Based on the overall analysis of all dimensions of cultural values in relation to the four executive levels, some variations have been observed. The results obtained from our industrial systems indicate the following conclusions:

- Openness is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Confrontation is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Trust is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Authenticity is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Proactivity is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Autonomy is higher with general directors and deputy directors (the first level of management) than with service executives and headmen (managers of the third and fourth level of management).
- Collaboration is higher with general directors and deputy directors (the first level of management) than with heads of sectors, service executives and headmen (managers of the second, third and fourth level of management).

Based on the results it can be concluded that managers at the first level of management communicate; there is interaction between them; they have confidence; they do not manipulate each other; they are proactive in business operations; they have the freedom to decide on all processes in the organization; and that they collaborate and support each other. However, lower-level managers are unable to share their problems with others, they are not proactive and confidential, not open to collaboration, and there is a lack of openness among them.

There are differences between managers dealing with service and manufacturing activities regarding the perception of the impact of organizational culture.

T-test has shown that there are statistical differences regarding the type of activity (Table 4 and 5).

Tab. 4: Differences regarding the type of activity; Lavene's test for equality of variances and t-test for the respondents from both public and private companies

Dependent variable	Levene's Test for Equality of Variances		T-test for Equality of Means				
	F	p	t	df	p	Differences M	Statistic deviation of difference of M
openness	.05	.82	-4.73	145	.00	-2.20	.46
confrontation	.00	.97	-5.14	148	.00	-2.43	.47
trust	.71	.40	-3.98	150	.00	-1.42	.36
authenticity	.09	.77	-3.87	145	.00	-1.25	.32
proactivity	.33	.57	-5.34	147	.00	-2.45	.46
autonomy	2.57	.11	-4.04	144	.00	-1.51	.37
collaboration	2.82	.10	-4.88	146	.00	-1.81	.37
experimentation	1.88	.17	-4.88	142	.00	-2.12	.43

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Tab. 5: Descriptive indicators regarding the differences in the type of activity

Dependent variable	Type of activity	N	Aritmetic mean	Standard deviation	Statistic deviation of the aritmetic mean
openness	service	89	12.79	2.57	.27
	manufacturing	58	14.98	3.02	.40
confrontation	service	89	13.04	2.77	.29
	manufacturing	61	15.48	2.95	.38
trust	service	90	10.61	1.99	.21
	manufacturing	62	12.03	2.40	.31
authenticity	service	89	10.37	1.94	.21
	manufacturing	58	11.62	1.88	.25
proactivity	service	90	12.82	2.60	.27
	manufacturing	59	15.27	2.94	.38
collaboration	service	89	13.13	1.98	.21
	manufacturing	57	14.65	2.52	.33
experimentation	service	90	13.02	1.94	.20
	manufacturing	58	14.83	2.55	.33

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Differences regarding the type of activity; Lavene's test for equality of variances and t-test for the respondents from both public and private companies:

- Openness ($t = -4.73$, $df = 145$, $p \leq 0.01$). Openness is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 14.98$, $s = 3.02$) then by service sector ($M = 12.79$, $s = 2.57$).
- Confrontation ($t = -5.14$, $df = 148$, $p \leq 0.01$). Confrontation is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 15.48$, $s = 2.95$) then by service sector ($M = 13.04$, $s = 2.77$).
- Trust ($t = -3.98$, $df = 141$, $p \leq 0.01$). Trust is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 12.03$, $s = 2.40$) then by service sector ($M = 10.61$, $s = 1.99$).
- Authenticity ($t = -3.87$, $df = 145$, $p \leq 0.01$). Authenticity is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 11.62 = 1.88$) then by service sector ($M = 10.37$ $s = 1.94$).
- Proactivity ($t = -5.34$, $df = 147$, $p \leq 0.01$). Proactivity is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 15.27$, $s = 2.94$) then by service sector ($M = 12.82$, $s = 2.60$).
- Collaboration ($t = -4.04$, $df = 146$, $p \leq 0.01$). Authenticity in the decision making process is rated more positively by respondents from the manufacturing sector (manufacturing company $M = 14.65$, $s = 2.52$) then by service sector ($M = 13.13$, $s = 1.98$).

The level of respondent's position regarding the dimensions of organizational culture is also analyzed in the research (table 6, 7 and 8).

Tab. 6: The level of the position of all respondents regarding the dimensions of organizational culture

	Level of position							
	Director, deputy, technical director		Head of the sector (division), branch		Head of the division, department/service		Headman	
	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation
openness	14.93	3.33	13.75	2.93	13.05	2.69	13.38	2.64
confrontation	15.14	3.18	13.91	3.09	13.20	3.08	14.31	2.53
trust	12.07	2.48	11.13	2.41	10.83	2.10	11.44	2.12
authenticity	11.72	2.15	10.85	2.01	10.43	1.80	10.82	1.89
proactivity	14.76	3.26	13.95	2.93	13.30	2.83	14.06	2.92
autonomy	14.32	2.64	13.86	2.23	13.20	2.37	13.75	1.83
collaboration	14.90	2.76	13.59	2.04	13.15	2.16	13.81	2.31
experimentation	14.04	2.74	13.64	2.85	13.23	2.69	14.58	2.70

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

To understand the results in our organizations, it is useful to consider the results obtained by the same questionnaire applied on the sample of employees in Indian companies as well. The study of cultural value profiles in the U.S. [9], and Pareek's research in Indian companies (Oil and Natural Gas Corporation Limited) provide the values and norms of high and low scores (Table 9). High scores indicate a strong belief in values, and hence a strong organizational culture. Low scores indicate a weak set of cultural values. If the average or mean score of an industrial system is low, the questions regarding the profile can be used as basis for planning measures for the improvement of the organization's culture.

These profile studies show that openness, confrontation and collaboration have low score; proactivity, autencity and autonomy have average score; while trust and experimentation have high score. The total sum is 113.95.

Tab. 7: The level of the position of respondents from companies under state/public ownership regarding the dimensions of organizational culture

	Level of position							
	Director, deputy, technical director		Head of the sector (division), branch		Head of the division, department/service		Headman	
	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation
openness	12.94	2.61	13.16	2.72	11.88	2.69	11.92	2.25
confrontation	13.41	2.67	13.33	3.05	12.23	3.15	12.69	2.21
trust	10.65	2.00	10.52	2.31	10.35	2.17	10.69	1.60
authenticity	10.82	2.19	10.44	2.00	9.92	1.80	10.38	1.33
proactivity	12.82	2.58	13.18	2.73	12.15	2.59	12.31	2.43
autonomy	12.71	2.14	13.36	2.10	12.27	2.24	13.08	1.93
collaboration	13.29	2.28	13.23	2.06	12.42	2.16	12.69	1.70
experimentation	12.94	2.68	13.05	2.79	11.75	2.25	12.42	2.43

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

Tab. 8: The level of the position of respondents from companies under private ownership regarding the dimensions of organizational culture

	Level of position							
	Director, deputy, technical director		Head of the sector (division), branch		Head of the division, department/service		Headman	
	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation	Aritmetic mean	Standard deviation
openness	18.00	1.73	16.09	2.63	14.93	1.28	14.29	2.49
confrontation	17.73	2.10	16.00	2.30	14.87	2.17	15.27	2.23
trust	14.27	1.42	13.33	1.15	11.67	1.72	11.87	2.28
authenticity	13.00	1.41	12.33	1.23	11.27	1.49	11.10	2.17
proactivity	17.73	1.74	16.75	1.71	15.43	1.91	15.14	2.71
autonomy	16.90	.32	15.67	1.72	14.93	1.49	14.15	1.69
collaboration	17.27	1.49	14.92	1.38	14.40	1.55	14.58	2.39
experimentation	16.22	1.39	16.00	1.61	15.60	1.24	15.81	2.02

Source: Data obtained within the Project no. 179052, supported by the Ministry of Education and Science of Republic of Serbia (own research)

According to the standards defined by Pareek, the result of the organizational culture can be in the range from 90–130.

Research results indicate that, when speaking of standards of cultural values in Serbia there are clear differences between companies under state/public and private ownership, as well as those from the manufacturing and service sector. In state-owned companies the The total sum of cultural values amounts to 97.76. In companies under private ownership The total sum of cultural values is 117.74.

The main problem identified in our study is that the second level of management fails to recognize the importance of organizational culture; it does not encourage its creation and maintenance. Also, one of the identified problems is that, contrary to the research

Tab. 9: Average values of cultural dimensions in India

Cultural dimensions	Indian organizations [19]
	Average value
1. Openness	13.91
2. Confrontation	13.72
3. Trust	15.16
4. Autencity	14.05
5. Proactivity	14.10
6. Autonomy	14.15
7. Collaboration	13.71
8. Experimentation	15.15
Total	113.95

Source: [19]

findings in organizations in India (Oil and Natural Gas Corporation Limited, [19]) where experimentation have high score, i.e. managers seek for new, innovative problem solving methods, trust and evaluate new ideas, the research results in Serbian organizations clearly indicate that none of the four levels of management dare to introduce new problem solving methods due to risks and uncertain outcomes. Unwillingness to introduce changes is reflected through the decision-making processes, especially in the choice of the most unacceptable business solutions.

A general view on cultural values abroad and in Serbia reveals differences in cultural dimensions, as well as in standards for specific cultural values. Contrary to foreign organizations, which need to improve openness, collaboration and confrontation, organizations in Serbia need to develop all dimensions of organizational culture. Also, it should be pointed out that the dimensions of organizational culture in Serbia are more expressed in manufacturing industrial systems than in service organizations, and that privately owned organizations recognize better organizational values in comparison with the state/public owned organizations.

Conclusion

The business world today is in the process of very rapid and numerous changes (globalization of the economy, the swift growth of electronic commerce, the increasing pace of business operations, rapid obsolescence of technological novelties, the rapid expansion of new companies in the world market), which inevitably imposes the need for the development of new models and forms of leadership.

According to the obtained results it is possible to define the existing value framework of the investigated organizational cultures, as well as the difference in the evaluation of cultural dimensions according to Pareek's model, depending on the level of management, type of organization (manufacturing or service-providing systems) and regarding the ownership structure of the studied organization. Managers at the higher level of management assess the dimensions of openness, collaboration and experimentation as more immanent, while the result of lower managers is significantly lower in all assessments of dimensions of organizational culture.

Managers working in manufacturing industrial systems assess the dimensions of culture such as openness, confrontation, autonomy and cooperation as low, while managers working in service organizations assess these dimensions even worse; openness, collaboration and experimentation have the lowest score.

Likewise, managers working in privately owned organizations assess the dimensions of openness, confrontation, autonomy, collaboration and experimentation as low, while those working in state/public-owned organizations assess openness, confrontation, collaboration and experimentation as low.

According to the findings it can be concluded that managers either do not have a clear insight into the functioning of the organization, or tend to adorn the reality of the systems they manage, or do not know what they need to do, and thus, try to present the situation at least as acceptable, and thereby surely decelerate the process of transition.

Prerequisites for making culture ready for changes in the conditions of transition in Serbia need to be focused on precisely determined working processes, system of responsibility and work motivation, and primarily on changes in organizational structures which are defined hierarchically; they are dysfunctional and therefore unable for rapid changes [8]. The research has also highlighted the problem in the employees' awareness and their personal

attitude towards changes which is burdened by their unrealistic perception of reality and the lack of professional attitude towards the work. Changes in the value system towards favoring innovation, trust, openness to new knowledge contribute more flexible and successful operations. Likewise, the creation of a culture of profound trust contributes the reduction in inertia and fear of risk.

Evans points out that culture of teaching is one of the most innovative levels related to strategic changes and it is reflected at two levels in the organization: at the level of individuals and their mutual relationships [28]. The level of individual is related to the leadership style that allows his full realization through encouragement, teaching and mentoring processes, nurturing the environment where people feel motivated and receive timely constructive feedback and continuous improvement of quality of the management implementation process. The level of mutual relationships refers to the level of availability and possibility to provide assistance through programs of specific development activities, as well as the application of knowledge management tools that enable understanding of innovative information and assist people in making good decisions.

The implementation of a desired organizational culture of changes involves primarily a change in the operation of managers employed in service-providing organizations under state/public ownership in order to define organizational behavior and maintain the direction that takes into consideration the specific situation, and includes work on the development of all segments of organizational behavior related primarily to the organizational culture.

References

[1] AL-KHALIFA, K.N., ASPINWALL, E.M. Using the competing values framework to investigate the culture of Qatar industries. *Total Quality Management.* 2001, Vol. 12, Iss. 4, pp. 417-428. ISSN 0954-4127.

[2] BROWN, A.D. Managing Understandings: Politics, Symbolism, Niche Marketing and the Quest for Legitimacy in IT Implementation. *Organization Studies*. 1995, Vol. 16, Iss. 6, pp. 951-969. ISSN 0170-8406.

[3] BROWN, A.D., STARKEY, K. The Effect of Organizational Culture on Communication and Information. *Journal of Management Studies*. 1994, Vol. 31, Iss. 6, pp. 807-828. ISSN 0022-2380.

[4] CABRERA, A., CABRERA, E.F., BARAJAS, S. The key role of organizational culture in a multi-system view of technology-driven change. *International Journal of Information Management*. 2001, Vol. 21, Iss. 3, pp. 245-261. ISSN 0268-4012.

[5] DEAL, T., KENNEDY, A. *Corporate Cultures: The Rites and Rituals of Corporate Life*. London: Penguin, 1982. ISBN 978-0201102772.

[6] DELLANA, S.A., HAUSER, R.D. Toward Defining the Quality Culture. *Engineering Management Journal*. 1999, Vol. 11, Iss. 2, pp. 11-15. ISSN 0265-671X.

[7] FOK, L.Y., FOK, W.M., HARTMAN, S.J. Exploring the relationship between total quality management and information systems development. *Information & Management*. 2001, Vol. 38, Iss. 6, pp. 355-371. ISSN 0378-7206.

[8] GRUBIĆ-NEŠIĆ, L. *Human resources development*. Novi Sad: AB print, 2005. ISBN 86-907943-0-1.

[9] HELLRIEGEL, D.J., SLOCUM, V. *Organizational Behavior.* 11th ed. Mason (OH): Thomson Higher Education, 2007. ISBN 978-0324-37712-6.

[10] HOFSTEDE, G. *Culture's Consequences: International Differences in Work Related Values*. Sage Publications, 1999. 327 p. ISBN 978-0803913066.

[11] HOREHÁJ, J., KUBISOVÁ, L. Individualistic mentality and economic education. *E+M Ekonomie a Management*. 2011, Vol. 14, Iss. 4, pp. 46-54. ISSN 1212-3609.

[12] KEKÄLE, T. *The Effects of Organizational Culture on Successes and Failures in Implementation of Some Total Quality Management Approaches. Towards a Theory of Selecting a Culturally Matching Quality Approach.* Vaasa: Acta Wasaensia, 1998. 195 p. ISBN 9516837670.

[13] KIM, J. Are we transiting from an industrial policy to a technology policy era?: a theoretical and empirical analysis. *International Journal of Technology Management.* 2010, Vol. 49, Iss. 1/2/3, pp. 155-173. ISSN 0267-5730.

[14] LEWIS, M.W., BOYER, K.K. Factors Impacting AMT Implementation: An Integrative and Focused Study. *Journal of Engineering and Technology Management*. 2002, Vol. 19, Iss. 2, pp. 111-130. ISSN 0923-4748.

[15] LIVARI, N. The role of organizational culture in organizational change – identifying a realistic position for prospective is research. In: *Proceedings*

of the Thirteenth European Conference on Information Systems. Mendeley, 2005.
[16] MCDERMOTT, C.M., STOCK, G.N. Organizational culture and advanced manufacturing technology implementation. *Journal of Operations Management*. 1999, Vol. 17, Iss. 5, pp. 521-533. ISSN 0272-6963.
[17] MITROVIC, S. *Managerial decision-making in industrial systems in the conditions of increased uncertainty and substantial risks in business*. Doctoral thesis, 2011. Faculty of technical sciences.
[18] O'REILLY III, C.A, CHATMAN, J., CALDWELL, D.F. People and Oragnizational Culture: A Profile Comparison Approuch to Assessing Person-Organization Fit. *Academy of Management Journal*. 1999, Vol. 34, Iss. 3, pp. 487-516. ISSN 1948-0989.
[19] PAREEK, U.N. *Training Instruments for Human Resource Development*. New Delhi: McGraw Hill, 1997. 636 p. ISBN 978-0074623299.
[20] PLISKIN, N., ROMM, T., LEE, A.S., WEBER, Y. Presumed Versus Actual Organizational Culture: Managerial Implications for Implementation of Information Systems. *The Computer Journal*. 1993, Vol. 36, Iss. 2, pp. 143-152. ISSN 1460-2067.
[21] POOL, S.W. The learning organization: motivating employees by integrating TQM philosophy in a supportive organizational culture. *Leadership & Organizational Development Journal*. 2000, Vol. 21, Iss. 8, pp. 373-378. ISSN 0143-7739.
[22] ROBBINS, S., COULTER, M. *Management*. NJ: Pearson Education Upper Saddle River, 2005. ISBN 0-13-127272-1.
[23] ROBEY, D., RODRIGUEZ-DIAZ, A. The Organizational and Cultural Context of Systems Implementation: Case Experience from Latin America. *Information & Management*. 1989, Vol. 17, Iss. 4, pp. 229-239. ISSN 0378-7206.
[24] RUPPEL, C.P., HARRINGTON, S.J. Sharing Knowledge Through Intranets: A Study of Organizational Culture and Intranet Implementation. *IEEE Transactions on Professional Communication*. 2001, Vol. 44, Iss. 1, pp. 37-52. ISSN 0361-1434.
[25] SCHEIN, E.H. *Organizational culture and leadership*. San Francisco: Jossey-Bass, 1995. ISBN 978-0787903626.
[26] SHADUR, K., KIENZLE, M.A., RODWELL, J.J. The Relationship Between Organizational Climate and Employee Perceptions of Involvement. *Group & Oragnization Management*. 1999, Vol. 24, Iss. 4, pp. 479-503. ISSN 1059-6011.
[27] SMIRCICH, L. Concepts of Culture and Organizational Analysis. *Administrative Science Quarterly.* 1983, Vol. 28, Iss. 3, pp. 339-358. ISSN 0001-8392.
[28] SOLMS, R., SOLMS, B. From policies to culture. *Computers and Security*. 2004, Vol. 23, Iss. 4, pp. 275-279. ISSN 0167-4048.
[29] TUNG, L.L., TAN, J.H., ER, J.P., LIAN, K., TURBAN, E. Adoption, implementation and use of lotus notes in Singapore. *International Journal of Information Management*. 2000, Vol. 20, Iss. 5, pp. 369-382. ISSN 0268-4012.

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Abstract

MANAGER'S ASSESSMENT OF ORGANIZATIONAL CULTURE

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This paper analyzes the dimension of organizational culture assessment by managers, in order to diagnose the results of the research directions of changes in management that contributed to the successful functioning of the organization. The research encompassed 168 managers within 8 companies of different structure and ownership type. A Pareek questionnaire was used to measure the dimensions of corporate culture. The managers have expressed their opinions on different corporate culture dimensions on a 4-level scale. In particular, the following were considered: openness, confrontation, trust, authenticity, proactivity, autonomy, cooperation and attitude towards experimenting. Determining dominant corporate culture dimensions has primarily a purpose of identifying: the current state of value dimensions of culture, differences between opinions of managers in public sector versus those in production companies, differences between opinions pertinent to different managerial levels, and opinions about possible impact of certain dimensions of corporate culture on behavior of employees within the companies encompassed in the study. Survey results indicate a clear difference in the assessment of organizational culture in relation to the level of managers, types of organizations (manufacturing or service) and ownership status of the organization (public or private). Higher levels of management rate higher the majority of dimensions of organizational culture as compared to the lower levels of management. Managers of manufacturing industrial systems rate higher the dimensions of organizational culture in comparison with the managers of the service sector.

Managers, as bearers of the culture, can contribute to establishment of desired cultural values that will promote the development of organization. In the long turbulent transition period that Serbia has been going through – and which has a negative impact on business performance of the companies – it is vital to determine the difference between the existing values and those desired that would contribute to the fastest development of the companies.

Key Words: *Dimensions of organizational culture, managers, organization.*

JEL Classification: *M14.*

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SEQUENCE DETERMINING OF CONSTRUCTION OF THE OFFSHORE WIND FARM CONSTRUCTION APPLYING PERMUTATION METHOD

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Introduction

The world oil crisis of the seventies has lead to important changes regarding energy resources and their exploitation. In the nineties, there was an increased focus on reducing the negative effects that the massive and uncontrolled use of the fossil fuels had on the environment. The beginning of the 21st century brought along new technologies in the green energy [29].

In recently have been recognized the value of wind power as a major renewable energy source for long term; because wind is free, clean and renewable [27].

Wind power one is the most deserving of all cleaner energy production options from technical, environmental, socio-economical and socio-political standpoint (geothermal, solar, tidal, biomass, hydro) for more widespread deployment [20].

The wind energy is one of the most widely exploited and rapidly evolved types of renewable energy [26].

The World Wind Energy Association (WWEA), claims that a capacity of the wind energy reaching a total value of 1900 GW is likely before the year 2020. China, USA, Germany, Spain, India and other countries, especially Eastern Europe, as well as many Asian countries and Latin America are expected to demonstrate a significant growth in this market [28].

Europe is the absolute leader in building the offshore wind turbines. One of the key reasons for building the offshore wind turbines is a lack of territory, suitable for the onshore stations. This situation is highly relevant in densely populated countries, such as Germany, Denmark, and Netherlands.

Report of The Wind Energy European Association, on the European level, generated a more detailed estimate for the year 2020 [21]:

- 230 GW of installed capacity (190 GW onshore, 40 GW offshore);
- Annual investments of 23.5 billion EUR (14.7 billion EUR onshore, 8.8 billion EUR offshore);
- Generation of 582 TWh of electric energy (433 TWh onshore, 148 TWh offshore);
- 14–17% of the entire EU energy request shall be generated by the wind energy production;
- Reduction of CO_2 emission by $333x10^6$ tons annually.

European Wind Energy Association estimated that in 2030 the offshore wind turbines will generate more energy compared to the onshore wind turbines.

Lithuania, being a member of the EU, should execute its assumed obligations related to this field. It is anticipated that in 2020 the wind turbines may produce 10 percent of all the electric power consumed in Lithuania. This means that the country should establish favorable conditions to build the wind turbines with a total power of 500 MW [11].

Onshore wind energy technology is more mature than offshore, but nowadays, there is a considerable trend to the establishment of offshore wind farms [26]. Offshore wind power as an upcoming technology and growing business to deliver renewable energy with no

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greenhouse gas emissions and without depleting fossil energy resources has startling perspectives for developers, authorities and society [2].

Wind energy is clean and inexpensive, but space for the turbines is becoming scarce, which makes offshore wind an attractive choice. Therefore, offshore wind power has recently been widely focused on and developed, as it is reliable, intensive, and its source is abundant and offers vast offshore areas. It can not only ease reliance on oil and cut down emissions, but also stimulate the marine economy development and offer job opportunities [10].

Offshore wind farms present higher investment, operational and maintenance cost, the significant offshore wind resource potential, the higher quality wind resources located at sea, the ability to use even larger wind turbines due to avoidance of certain land and the ability of construction of even larger power plants than onshore, as there is no geographical "limit", form the primary motivations of developing offshore wind energy [26].

Development of such farms is highly promising for the distressed coastal regions, with the fishery businesses and shipbuilding companies closing down. In order to select a suitable offshore territory for construction of the wind turbines, the entire marine area should be mapped out in detail.

The offshore wind energy farms compared to the onshore wind farms have advantages [13] as follows:

- Wind is stronger and steady, thus energy content is greater by 40%;
- Invisible from the shore, thus no issues of visual or noise-related disturbances;
- Territorial restrictions may be avoided;
- Greater power generation;
- Better connection of electrical network;
- Lower wind turbulence means lower depreciation of installations and almost maintenance-free operation.

There exists main negative aspects for the offshore wind turbines:

- Higher project implementation costs;
- More expensive substructure (groundwork);
- Adverse weather conditions obstruct construction works;
- Limited industrial experience;
- Higher requirements for corrosion resistant materials, i.e. exposure to salt, water, and air;

Safety and effect issues on flora and fauna as well as natural habitats.

1. Selection Criteria for Wind Farm Locations

The offshore wind turbines opened new possibilities for service and public utility service sectors as well as a labor market. Problem of selection construction for sites wind farms is both economic, technical and management problem.

Good location's selection leads to success of wind farms construction. There are three key factors influencing the location of wind farms as follows: wind energy output, grid availability and construction conditions [15].

Having completed a thorough collection of data, entire information is processed in order to select a potential and appropriate location for the wind farms – a multiple criteria analysis is conducted.

The choice of energy generation is multi-criteria decision-making process made up of a number of aspects at different levels [3].

In order to analyze potential locations for construction of the wind turbines, it is necessary to gather and process the data, defining very detailed features and parameters of a specific location intended for construction. These data can be divided into two main categories [14]:

- Information on the restricted areas within the region of interest;
- Information on the relevant characteristics in the region of interest.

The first group is includes all the exceptions that occur in the marine area being studied, either natural or human imposed, that restrict the use of a particular region. These areas are used to define exclusion areas, and as a consequence are not used in the analysis [14]:

- Harbour entrances and navigation routes;
- Areas with environmental restrictions;
- Oil and gas extraction;
- Military exercise areas;
- Underwater cables;
- Sand and gravel extraction;
- Marine archaeology sites;
- Landscape and seascape as public heritage.

The second group determines all the technical constraints that will allow evaluating

the locations regarding its suitability for the deployment of wind and wave energy conversion systems [14]:

- Water depth;
- Distance to shore;
- Wind energy resource;
- Investment costs;
- Energy production capacity;
- Realization time;
- CO_2 emissions avoided;
- Acoustic noise;
- Social acceptability;
- Seabed Geology;
- Safety;
- Area of the territory;
- Max power on the area;
- Other.

2. Application of Permutation Method for Multi-Criteria Analysis

To solve the problem was selected the permutation method. The permutation method uses Jaquet-Lagreze's feasible permutations of all possible rankings and alternatives [6]. When applying this method all permutations of alternatives according to their preferability are checked and compared among themselves [30]. This method allows dealing with quantitative data as well as with data expressed in words (lexicographic defined data) and enables us define the most appropriate ordering of alternatives. The method was developed by Paelinck [16].

Suppose a number of alternatives $(a_i, i=1,2,...,m)$ have to be evaluated according to attributes $(x_j, j=1,2,...,n)$. Decision making matrix is a set up according to the form [24]:

$$P = \begin{array}{c} \\ a_1 \\ \vdots \\ a_m \end{array} \begin{bmatrix} & & \\ x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \qquad (1)$$

For a solution of problems there exists an obligatory set of criteria weight coefficients w_j:

$$w_j = 1,2,\ldots,n, \ \sum_{j=1}^{n} w_j = 1. \qquad (2)$$

The aim is to choose the most appropriate alternative from the m feasible alternatives. That is, one must assign the preferability relationship on the set of alternatives, or what is same, find the rearrangement of alternatives which fit best the system of values [30].

Let us assume there exists 3 feasible. Then there exist $m! = 3\times2\times1 = 6$ permutations [30]:

$$\pi_1 = a_1 \succ a_2 \succ a_3;\ \pi_2 = a_1 \succ a_3 \succ a_2;\ \pi_3 = a_2 \succ a_1 \succ a_3;$$
$$\pi_4 = a_2 \succ a_3 \succ a_1;\ \pi_5 = a_3 \succ a_1 \succ a_2;\ \pi_6 = a_3 \succ a_2 \succ a_1.$$

In case of the checked order of alternatives is π_2 there could to be stated concordance partial order is: $\{a_1 \le a_3; a_1 \le a_2; a_3 \le a_2\}$, and the set of discordance partial order is: $\{a_1 \le a_3; a_1 \le a_2; a_3 \le a_2\}$.

If in ranking (permutation) of alternatives the partial ranking $a_k > a_l$ appears, it means that $x_{kj} \ge x_{lj}$ will be rated w_j and $x_{kh} \le x_{lh}$ will be rated $(-w_h)$.

The ranking of alternatives $\beta_g (g = 1,2,...,m!)$ is carried out as described above.

Let us suppose that there is g^{th} permutation: $\pi_g = \{\cdots, a_k, \cdots, a_l, \cdots\}, g = 1,2,\cdots,m!,$ where a_k is preferable to a_l. Then to this permutation there is given following evaluation criterion β_g:

$$\beta_g = \sum_{k,l=1}^{m} \sum_{j \in C_{kl}} w_j - \sum_{k,l=1, k \ne l}^{m} \sum_{j \in C_{kl}} w_j; \quad (g = 1,2,\cdots,m!), \qquad (3)$$

where,

$$C_{kl} = \{j \mid x_{kj} \ge x_{lj}\}, k, \ l = 1,2,\ldots,m; \ k \ne l;$$

$$H_{kl} = \{j \mid x_{kj} \prec x_{ej}\}, k, \ l = 1,2,\ldots,m; \ k \ne l.$$

The best concordant ordering is the one which value β_g is the largest.

The permutation method requires weights of criteria. For this purpose there was selected AHP (Analytic Hierarchy Process) method. AHP [19] is one of the most popular multi-criteria decision-making models. AHP involves quantification based on comparative and relative evaluation. It is one of the most widely used methods to determine criteria weights. All the AHP calculations and evaluations were carried out using a software, MakeItRational [7].

AHP method was suggested by Saaty [18] in 1980. Saaty established 9 objects as the upper limit of his integer scale for multiple pair wise comparisons [25]. Generally we can represent the comparative importance scale of criteria as shown in Table 1.

Tab. 1: Comparative importance scale of critetia

Intensity of importance	Definition
1	Criteria *i* and *j* have equal importance
3	Criterion *i* is moderately more important than criterion *j*
5	Criterion *i* is strongly more important than criterion *j*
7	Criterion *i* is very strongly or demonstrably more important than criterion *j*
9	Criterion *i* is extremely more important than criterion *j*
2, 4, 6, 8	Compromise values between the two adjacent judgments
Reciprocals nonzero	If activity *i* has one of the nonzero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*

Source: own

The AHP method is based on the pair-wise comparison matrix. Experts compare all the evaluation criteria:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} & \cdots & a_{1n} \\ \vdots & \vdots & & \vdots & & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} & \cdots & a_{1n} \\ \vdots & \vdots & & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nj} & \cdots & a_{nn} \end{bmatrix}, \quad (4)$$

$$a_{ij} = w_i / w_j, \; i, j = 1,2,...,n \quad (5)$$

Thus, when the matrix A is multiplied by the vector formed by each weighting $w = (w_1, w_2,..., w_n)^T$, one gets:

$$Aw = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \cdots & \frac{w_1}{w_j} & \cdots & \frac{w_1}{w_n} \\ \vdots & \vdots & & \vdots & & \vdots \\ \frac{w_i}{w_1} & \frac{w_i}{w_2} & \cdots & \frac{w_i}{w_j} & \cdots & \frac{w_i}{w_n} \\ \vdots & \vdots & & \vdots & & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \cdots & \frac{w_n}{w_j} & \cdots & \frac{w_n}{w_n} \end{bmatrix} \cdot \begin{bmatrix} w_1 \\ \vdots \\ w_j \\ \vdots \\ w_n \end{bmatrix} = \begin{bmatrix} w'_1 \\ \vdots \\ w'_j \\ \vdots \\ w'_n \end{bmatrix} \quad (6)$$

In the AHP the pair-wise comparisons in a judgment matrix are considered to be adequately consistent if the corresponding consistency ratio *(CR)* is less than 10% [18]. First the consistency index *(CI)* needs to be estimated. This is done by adding the columns in the judgment matrix and multiply the resulting vector by the vector of priorities (i.e. the approximated eigenvector) obtained earlier. This yields an approximation of the maximum eigenvalue, denoted by λ_{max} [23]:

$$\lambda_{max} = \frac{1}{n}\left(\frac{w'_1}{w_1} + \frac{w'_2}{w} + ... + \frac{w'_n}{w_n} \right) \quad (7)$$

By this method, one can obtain the characteristic vector, referred to as the priority vector. Besides this Saaty suggested the consistency index $C.I = (\lambda_{max} - n)/(n - 1)$. Next the consistency ratio *C.R* is obtained by dividing the *C.I* value by the Random Consistency index *(R.I): C.R=C.I/R.I. R.I* as values given in table 2.

Tab. 2: *RI* values for different values of *n*

n	1	2	3	4	5	6	7	8	9	10	11	12
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48

Source: own

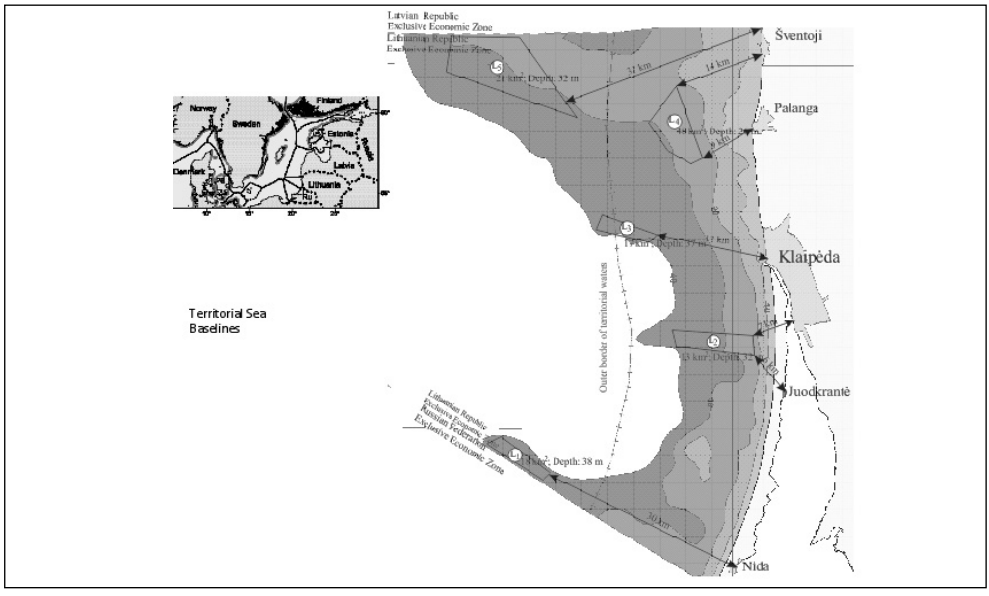
3. Case study

With the issues arising due to a limited use of the land, noise generated by the wind turbines or other issues and seeking to use the entire wind potential of the Baltic Sea, an option of the offshore wind farms is highly appreciated.

At present tame there is no built offshore wind farms in Lithuania. The international project "Development Prospects of Offshore Wind Energy in Marine Areas of Lithuania, Poland and Russia (POWER)", was identified in 2008 the marine area and an exclusive economic zone of Lithuania a potential region for construction of the wind farms [22].

It is stated that waters belonging to the Republic of Lithuania may shelter five wind farms. The main objective of the task is to establish a sequence for the wind turbine construction, a total power of which would approximately reach up to 1065 MW. Fig.1 presents a preliminary layout of the wind farms [5].

Fig. 1: Preliminary layout of the wind farms



Source: The model for economical feasibility study of offshore wind power parks [22]

The key criteria were selected for multi-criteria analysis:

- x_1 – area of the territory (km2) – Area covered by the wind farms.
- x_2 – water depth (m) – The water depth at the site is a very strong technical limitation and site evaluation. Within the technically admissible range typically the shallower the water depth the most suitable the location, as it usually means reduced construction costs [14].
- x_3 – distance to shore (km) – The distance to shore is measured in straight line, as it is meant to evaluate the cost of the submarine cable that connects to land [14].
- x_4 – average wind velocity (m/s) – For offshore wind systems this parameter is essential for the evaluation of the sites. Wind velocity is determined by performing annual wind parameters' measurements (averaging of observation data of the closest meteorological station) [12].
- x_5 – max power on the area (10^3 MW) – The power plants park may be constructed very widely or vice versa. Each separate wind power plant has an operation area it needs. This way we may assess the power plants on a certain area [1].
- x_6 – amount of energy per year (MWh) – How much energy the wind power plants farm produces in fact [1].

- x_7 – investments (10^6 €) – Construction, electrical connection, grid connection, planning, wind turbines, approvals, utilities and management are the main components of capital cost for wind farm projects [9].
- x_8 – CO_2 (10^3 t) – this is one of the most important criterion why a wind power plants park is constructed. It is very important in construction of wind power plants. It differs in each country [1].

The initial criteria for evaluation of alternatives are given in Table 1 [17].

Tab. 3: Initial decision-making matrix

Optimum	Criteria	Alternatives					Weights
		L_1	L_2	L_3	L_4	L_5	w_i
max	x_1	18	33	17	48	121	0.098
min	x_2	38	32	37	26	32	0.103
min	x_3	52	20	16,5	11,8	31	0.074
max	x_4	9.50	8.41	8.90	8.1	9.60	0.088
max	x_5	80	150	75	215	545	0.118
max	x_6	327.7	519.3	282.5	703.8	2262.2	0.211
min	x_7	290.4	348.5	192.6	457.3	1160.3	0.246
min	x_8	205.1	325.1	176.8	440.6	1416.1	0.062

Source: own

The criteria weights were determined by the AHP method based on the answers of 11 experts. According to the data obtained from the interview in Table 3, one can construct the matrix A and further calculate the weight of every criteria, the maximum eigenvalue (λ_{max}), the consistency index (*C.I*) and the consistency rate (*C.R*) as follows. An examples show for one expert:

$$Aw = \begin{bmatrix} 1 & 1 & 2 & 2 & 1/3 & 1/3 & 1/5 & 1/5 \\ 1 & 1 & 1 & 1 & 1/2 & 1/5 & 1/5 & 3 \\ 1/2 & 1 & 1 & 1/2 & 1/2 & 1/3 & 1/4 & 2 \\ 1/2 & 1 & 2 & 1 & 1 & 1/4 & 1/4 & 3 \\ 3 & 2 & 2 & 1 & 1 & 1/2 & 1/2 & 4 \\ 3 & 5 & 3 & 4 & 2 & 1 & 1 & 3 \\ 5 & 5 & 4 & 4 & 2 & 1 & 1 & 7 \\ 1/2 & 1/3 & 1/2 & 1/3 & 1/4 & 1/3 & 1/7 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0.081 \\ 0.070 \\ 0.062 \\ 0.081 \\ 0.136 \\ 0.239 \\ 0.294 \\ 0.037 \end{bmatrix} = \begin{bmatrix} 0.694 \\ 0.579 \\ 0.508 \\ 0.695 \\ 1.137 \\ 2.019 \\ 2.388 \\ 0.314 \end{bmatrix}$$

$$\lambda_{max} = \frac{1}{8}\left(\frac{0.694}{0.081} + \frac{0.579}{0.070} + \frac{0.508}{0.062} + \frac{0.695}{0.081} + \frac{1.137}{0.136} + \frac{2.019}{0.239} + \frac{2.388}{0.294} + \frac{0.314}{0.037}\right) = 8.387$$

$$C.I = \frac{8.387 - 8}{8 - 1} = 0.055$$

$$C.R = \frac{0.055}{1.41} = 0.039$$

Based on 11 expert answers criteria weights were determined as follows: w_1=0.098, w_2=0.103, w_3=0.074, w_4=0.088, w_5=0.118, w_6=0.211, w_7=0.246, w_8=0.062.

The establishment of preferences of alternatives according to the set of quantitative and qualitative criteria was performed using the method of permutations [4], [8], [30], [31].

At five feasible alternatives of wind farms there can be 5! =5×4×3×2×1=120 permutations. The calculation process shortly is presented in Table 4.

Tab. 4: Feasible permutations and calculation process of evaluation criterion (part 1)

	$\pi_1=L_1>L_2>L_3>L_4>L_5$				
	L_1	L_2	L_3	L_4	L_5
L_1	0	0.088+0.246+ +0.062=0.396	0.098+0.088+ +0.118+0.211= =0.515	0.088+0.246+ +0.062=0.396	0.246+0.062= =0.308
L_2	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0	0.098+0.103+ +0.118+0.211= =0.530	0.088+0.246+ +0.062=0.396	0.074+0.246+ +0.062=0.382
L_3	0.103+0.074+ +0.246+0.062= =0.485	0.074+0.088+ +0.246+0.062= =0.470	0	0.088+0.246+ +0.062=0.396	0.074+0.246+ +0.062=0.382
L_4	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0	0.103+0.074+ +0.246+0.062= =0.485
L_5	0.098+0.103+ +0.074+0.088+ +0.118+0.211= =0.692	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.088+0.118+ +0.211=0.618	0.098+0.088+ +0.118+0.211= =0.515	0
Evaluation criterion β_1		Concordance values		Non-concordance values	
4.186-5.711=-1.525		0.396+0.515+0.396+0.308+0.530+ 0.396+0.382+0.396+0.382+0.485= =4.186		0.604+0.485+0.470+0.604+0.604+ +0.604+0.692+0.515+0.618+0.515= =5.711	
	$\pi_2=L_1>L_2>L_3>L_5>L_4$				
	L_1	L_2	L_3	L_5	L_4
L_1	0	0.088+0.246+ +0.062=0.396	0.098+0.088+ +0.118+0.211= =0.515	0.246+0.062= =0.308	0.088+0.246+ +0.062=0.396
L_2	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0	0.098+0.103+ +0.118+0.211= =0.530	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396
L_3	0.103+0.074+ +0.246+0.062= =0.485	0.074+0.088+ +0.246+0.062= =0.470	0	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396
L_5	0.098+0.103+ +0.074+0.088+ +0.118+0.211= =0.692	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.088+0.118+ +0.211=0.618	0	0.098+0.088+ +0.118+0.211= =0.515
L_4	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.103+0.074+ +0.246+0.062= =0.485	0
Evaluation criterion β_2		Concordance values		Non-concordance values	
4.216-5.681=-1.465		0.396+0.515+0.308+0.396+0.530+ 0.382+0.396+0.382+0.396+0.515= =4.216		0.604+0.485+0.470+0.692+0.515+ +0.618+0.604+0.604+0.604+0.485= =5.681	

Tab. 4: Feasible permutations and calculation process of evaluation criterion (part 2)

	$\pi_{117}=L_5>L_4>L_2>L_1>L_3$				
	L_5	L_4	L_2	L_1	L_3
L_5	0	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.074+0.088+ +0.118+0.211= =0.692	0.098+0.103+ +0.088+0.118+ +0.211=0.618
L_4	0.103+0.074+ +0.246+0.062= =0.485	0	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604
L_2	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.118+0.211= =0.530
L_1	0.246+0.062= =0.308	0.088+0.246+ +0.062=0.396	0.088+0.246+ +0.062=0.396	0	0.098+0.088+ +0.118+0.211= =0.515
L_3	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0.074+0.088+ +0.246+0.062= =0.470	0.103+0.074+ +0.246+0.062= =0.485	0
Evaluation criterion β_{117}		Concordance values		Non-concordance values	
5.801-4.096=1.705		0.515+0.515+0.692+0.618+0.604+ 0.604+0.604+0.604+0.530+0.515= =5.801		0.485+0.382+0.396+0.308+0.396+ 0.396+0.382+0.396+0.470+0.485= =4.096	
	$\pi_{119}=L_5>L_4>L_3>L_1>L_2$				
	L_5	L_4	L_3	L_1	L_2
L_5	0	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.088+0.118+ +0.211=0.618	0.098+0.103+ +0.074+0.088+ +0.118+0.211= =0.692	0.098+0.088+ +0.118+0.211= =0.515
L_4	0.103+0.074+ +0.246+0.062= =0.485	0	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604
L_3	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0	0.103+0.074+ +0.246+0.062= =0.485	0.074+0.088+ +0.246+0.062= =0.470
L_1	0.246+0.062= =0.308	0.088+0.246+ +0.062=+0.396	0.098+0.088+ +0.118+0.211= =0.515	0	0.088+0.246+ +0.062=0.396
L_2	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0.098+0.103+ +0.118+0.211= =0.530	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0
Evaluation criterion β_{119}		Concordance values		Non-concordance values	
5.503-4.394=1.109		0.515+0.618+0.692+0.515+0.604+ 0.604+0.604+0.485+0.470+0.396= =5.503		0.485+0.382+0.396+0.308+0.396+ 0.515+0.382+0.396+0.530+0.604= =4.394	

Tab. 4: Feasible permutations and calculation process of evaluation criterion (part 3)

	$\pi_{120}=L_5>L_4>L_3>L_2>L_1$				
	L_5	L_4	L_3	L_2	L_1
L_5	0	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.088+0.118+ +0.211=0.618	0.098+0.088+ +0.118+0.211= =0.515	0.098+0.103+ +0.074+0.088+ +0.118+0.211= =0.692
L_4	0.103+0.074+ +0.246+0.062= =0.485	0	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604	0.098+0.103+ +0.074+0.118+ +0.211=0.604
L_3	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0	0.074+0.088+ +0.246+0.062= =0.470	0.103+0.074+ +0.246+0.062= =0.485
L_2	0.074+0.246+ +0.062=0.382	0.088+0.246+ +0.062=0.396	0.098+0.103+ +0.118+0.211= =0.530	0	0.098+0.103+ +0.074+0.118+ +0.211=0.604
L_1	0.246+0.062= =0.308	0.088+0.246+ +0.062=0.396	0.098+0.088+ +0.118+0.211= =0.515	0.088+0.246+ +0.062=0.396	0
Evaluation criterion β_{120}		Concordance values		Non-concordance values	
5.711-4.186=1.525		0.515+0.618+0.515+0.692+0.604+ 0.604+0.604+0.470+0.485+0.604= =5.711		0.485+0.382+0.396+0.382+0.396+ 0.530+0.308+0.396+0.515+0.396= =4.186	

Source: own

The value $\beta_{117}=1.705$ is the largest. Hence, the permutation should be regarded as the most rational and on its base a series of wind turbine park alternatives according to their preferences should be constructed.

Conclusions

During the last past years, the wind energy has become a widely used source of energy seeking to maximize a use of renewable energy sources compared to fossil fuel or nuclear energy. For this reason, the wind farms is a highly relevant issue, which should be analyzed in-depth in order to prosper with technologically and economically effective production of the wind energy without harming the environment and wellbeing of the society.

Executing obligations to the European Union Lithuania has been highly interested and focused on renewable energy sources and wind energy in particular. Seeking a greater and more effective use of the wind turbines, it was determined that an option of building the wind farms in the Baltic Sea does really exist. Considering the experience of other countries, the offshore wind turbines feature a great potential.

The marine area, belonging to Lithuania, might potentially shelter five wind farms, a total power of which might approximately reach 1065 MW.

Calculations were made in order to estimate the best sequence for the wind turbine construction related process. Having the key criteria identified (investments, amount of energy per year, max power on the area, water depth, area of the territory, average wind velocity, distance to shore, CO_2) and using the permutation method, a construction sequence for the wind farms in the Baltic Sea, close to the costal lines of Lithuania, has been established – $\{L_{117}\}=\{L_4 > L_5 > L_2 > L_3 > L_1\}$.

Having all of the possible wind farms built over the years, Lithuania would not only execute its obligations to the European Union, but would also contribute to building its energy diversification.

References

[1] BAGOČIUS, V., ZAVADSKAS, E.K., TURSKIS, Z. Multi-person selection of the best wind turbine based on multi-criteria integrated additive-multiplicative utility function. *Journal of civil engineering and management.* 2014, Vol. 20, Iss. 4, pp. 590-599. ISSN 1392-3730.

[2] BRETON, S.P., MOE, G. Status, plans and technologies for offshore wind turbines in Europe and North America. *Renewable Energy.* 2009, Vol. 34, Iss. 3, pp. 646-654. ISSN 0960-1481.

[3] CAVALLARO, F., CIRAOLO, L. A multicriteria approach to evaluate wind energy plants on an Italian island. *Energy Policy.* 2005, Vol. 33, Iss. 2, pp. 235-244. ISSN 0301-4215.

[4] FIEDLER, K., PELDSCHUS, F., ZAVADSKAS, E.K. Methoden der bautechnologischen Enschei dung. *Wiss. Berichte der Technischen Hochschule Leipzig*. 1986, pp. 17-56.

[5] GULBINSKAS, S. Wind energy development opportunities in the Baltic sea. In *Conference Wind Energy Development and Prospects.* 2009, June 15, Vilnius.

[6] HWANG, C.L., YOON, K.S. *Multiple Attribute Decision Making. Methods and Applications*. Berlin, Heidelberg, New York: Springer-Verlag, 1981. 259 pp. ISBN 978-3-642-48318-9.

[7] ISHIZAKA, A., NEMERY, P. *Multi-criteria decision analysis: methods and software*. West Sussex: Wiley, 2013. 310 pp. ISBN 978-1-119-97407-9.

[8] KILDIENE, S., ZAVADSKAS, E.K., TAMOŠAITIENE, J. Complex assessment model for advanced technology deployment. *Journal of civil engineering and management.* 2014, Vol. 20, Iss. 2, pp. 280-290. ISSN 1392-3730.

[9] LEE, A.H.I., CHEN, H.H., KANG, H.Y. Multi-criteria decision making on strategic selection of wind farms. *Renewable Energy.* 2009, Vol. 34, Iss. 1, pp. 120-126. ISSN 0960-1481.

[10] LEUNG, D.Y.C., YANG, Y. Wind energy development and its environmental impact: A review. *Renewable and Sustainable Energy Reviews.* 2012, Vol. 16, Iss. 1, pp. 1031-1039. ISSN 1364-0321.

[11] Ministry of Energy of the Republic of Lithuania. National Energy Independence Strategy of the Republic of Lithuania. Vilnius, Nr. XI-2133, 2012. ISBN 978-609-95429-0-4.

[12] MARKEVIČIUS, A., KATINAS, V., MARČIUKAITIS, M. Wind energy development policy and prospects in Lithuania. *Energy Policy*. 2007, Vol. 35, Iss. 10, pp. 4893-4901. ISSN 0301-4215.

[13] MILLER, G.T., SPOOLMAN, S.E. *Living in the environment. Principles, Connections, and Solutions*. 16th ed. Cengage Learning, 2009. 828 p. ISBN 978-0495556718.

[14] MURPHY, J., LYNCH, K., SERRI, L., AIRDOLDI, D., LOPES, M. Site Selection Analysis for Offshore Combined Resource Projects in Europe. In *Results of the FP7 ORECCA Project Work Package 2.* ORECCA, 28th October, 2011. 117 p. Available also from: http://www.orecca.eu/c/document_library/get_file?uuid=1fff9401-0348-463e-8a6f-62dfd21bdfc8&groupId=10129.

[15] OZERDEM, B., OZER, S., TOSUN, M. Feasibility study of wind farms: A case study for Izmir, Turkey. *Journal of Wind Engineering and Industrial Aerodynamics*. 2006, Vol. 94, Iss. 10, pp. 725-743. ISSN 0167-6105.

[16] PAELINCK, J. Qualitative multiple criteria analysis: on application to airport location. *Netherlands economic institute: paper prepared for second Tokyo environmental conference*. 24 p. Rotterdam, August, 1976.

[17] *Project POWER* [online]. Baltic offshore energy cluster, 2008 [cit. 2014-02-10]. Available from: http://www.bosec.lt/eco/eco_lt.html.

[18] SAATY, T.L. *The Analytic Hierarchy Process: Planning, Priority Setting*, *Resource Allocation*. Mcgraw-Hill. 1980. 287 p. ISBN 978-0070543713.

[19] SAATY, T.L., VARGAS, L.G. *Models, methods, concepts and applications of the analytic hierarchy process*. Berlin, Heidelberg, London: Springer, 2012. 353 p. ISBN 978-1-4614-3597-6.

[20] TALINLI, I., TOPUZ, E., AYDIN, E., KABAKCI, S. [Chap.] 10, A Holistic Approach for Wind Farm Site Selection by Using FAHP. In SUVIRE, O.G. (ed.). *Wind Farm – Technical Regulations, Potential Estimation and Siting Assessment*. 2011. 246 p. ISBN 978-953-307-483-2.

[21] *The European wind energy association* [online]. Winds energy basics 2014 [cit. 2014-03-15]. Available from: www.ewea.org.

[22] The model for economical feasibility study of offshore wind power parks. *Perspectives of Offshore Wind Energy development in marine areas of Lithuania, Poland and Russia*, *Lithuania.* 2008. 30 p.

[23] TRIANTAPHYLLOU, E., MANN, S.H. Using the analytic hierarchy process for decision making in engineering applications: some challenges. *International Journal of Industrial Engineering: Applications and Practice*. 1995, Vol. 2, Iss. 1, pp. 35-44. ISSN 1072-4761.

[24] TURSKIS, Z. Multi-attribute contractors ranking method by applying ordering of feasible alternatives of solutions in terms of preferability technique. *Baltic Journal on Sustainability.* 2008, Vol. 14, Iss. 2, pp. 224-239. ISSN 2029-4913.

[25] TURSKIS, Z., ZAVADSKAS, E.K. A new fuzzy additive ratio assessment method (ARAS-F). Case study: The analysis of fuzzy multiple criteria

in order to select the logistic centers location. *Transport*. 2010, Vol. 25, Iss. 4, pp. 423-432. ISSN 1648-4142.
[26] VAGIONA, D.G., KARANIKOLAS, N.M. A multicriteria approach to evaluate offshore wind farms siting in Greece. *Global NEST Journal*. 2012, Vol. 14, Iss. 2, pp. 235-243. ISSN 1790-7632.
[27] WELCH, J., VENKATESWARAN, A. The Dual Sustainability of Wind Energy. *Renewable and Sustainable Energy Reviews*. 2009, Vol. 13, Iss. 5, pp. 1121-1126. ISSN 1364-0321.
[28] WINDPOWER, DVORAK, P. *World Wind Energy Assn sees 1,900 GW* by 2020 [online]. Windpower, Engineering and development, 2010-09-22 [cit. 2014-03-10]. Available from: http://www.windpowerengineering.com/policy/world-wind-energy-assn-sees-1900-gw-by-2020/.
[29] ZAMFIROIU, C.E. *Selection of the investment projects „Wind farms in Romania" by using multi-criteria methods for sustainable development*. 2011. Available also from: http://www.dafi.ase.ro/revista/5/Zamfiroiu%20Carmen%20Elena.pdf.
[30] ZAVADSKAS, E.K., PELDSCHUS, F., KAKLAUSKAS, A. *Multiple criteria evaluation of projects in construction*. Vilnius: Technika, 1994. 226 p. ISBN 9986050464.
[31] ZAVADSKAS, E.K., TURSKIS, Z., TAMOSAITIENE, J. Selection of construction enterprises management strategy based on the SWOT and multi-criteria analysis. *Archives of Civil and Mechanical Engineering*. 2011, Vol. 11, Iss. 4, pp. 1063-1082. ISSN 1644-9665.

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Abstract

SEQUENCE DETERMINING OF CONSTRUCTION OF THE OFFSHORE WIND FARM CONSTRUCTION APPLYING PERMUTATION METHOD

Vygantas Bagočius, Edmundas Kazimieras Zavadskas, Zenonas Turskis

Ranking of work or feasible investments is one of high-importance keys for successful economic development. The share of renewable energy sources in the Lithuanian primary energy supply is on the lowest among EU. Only bio fuel, hydro and wind power can be considered as potential renewable energy sources in Lithuania at present time. Wind energy generation mature technology and comparatively low cost make it promising as an important primary energy source in the nearest future.

The aim of this paper is to determine the sequence for the wind turbine construction in the waters of Lithuania. The key criteria set for was determined for the problem solution: area of the territory, water depth, distance to shore, average wind velocity, max power on the area, amount of energy per year, investments and CO2. AHP method is used to estimate criteria weights. The problem was solved applying multi-attribute permutation method. This method allows dealing with qualitative and quantitative as well as with linguistic (verbal) data.

Key Words: *Offshore wind turbine, multi-criteria decision-making, permutation method, AHP method.*

JEL Classification: *G34, M12.*

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DESTINATION ATTRACTIVENESS OF SLOVAKIA: PERSPECTIVES OF DEMAND FROM MAJOR TOURISM SOURCE MARKETS

Kristína Pompurová, Ivana Šimočková

Introduction

According to World Travel & Tourism Council [12], in 2011, tourism generated 9.1% of global GDP and its total impact of 8.3% of world employment makes it the world's leading job sustainers with almost 255 million jobs created. Despite a considerable tourism potential of Slovakia, its economic benefits are significantly lower (tourism generated 6% of GDP and 5.8% of total employment, which ranks it at 71st place from 181 countries according to WTTC). Gúčik [2] conditions the improvement of the role of tourism, as a tool for economic, social and cultural development of state, by increase of its destination attractiveness. An analogous idea can also be found in the strategic documents of Slovak tourism (such as the New Tourism Development Strategy 2013 and the forthcoming Tourism Development Strategy for Slovakia until 2020). These documents draw attention to the increasing attractiveness of Slovakia that may lead to enhancement of its tourism competitiveness with a better use of its potential, balance of regional disparities and creation of new jobs.

The concept of destination attractiveness does not represent a new topic in scientific literature. On the contrary, a significant attention has been paid to this concept since the 1960s, however, a relatively long period of its research and examination did not result in a synthesizing evaluation platform but rather led to the fragmentation of researchers' views. Up to date, many authors try to identify the destination attractiveness and the factors influencing the decision-making process of visitors (selected target market) when evaluating a particular territory as a possible tourism destination. Since destination attractiveness depends not only on the characteristics of the territory and its inhabitants, but also on the features of each target market [8], the research focuses on their selection and differentiation.

The aim of this paper is to examine the attractiveness of Slovakia as a tourism destination in terms of demand of its major tourism source markets. Selected target market for examination of Slovakia's attractiveness was identified according to several criteria – (1) belonging to the priority target market of tourism as defined in the basic tourism policy documents of Slovakia, (2) similarity in terms of degree of international economic integration among countries, which determines the freedom of movement of persons and the removal of formalities when traveling, (3) an analogy in terms of living standards, which predetermines the travel intensity and stay of persons outside their habitual residence, respectively fulfilment of the vacation needs and (4) similarity in terms of tourism development degree (location, natural conditions and historical development), which is predominant in determining the population's decision-making between domestic and outbound tourism.

We examined Slovakia's attractiveness as a tourism destination on the example of its citizens, as well as residents of neighbouring Czech Republic, Hungary and Poland. Together, they form the Visegrad Four (V4) as a community of Central European countries, which supports mutually beneficial cooperation in various areas. In tourism, they seek to penetrate into distant markets through their joint marketing activities. However, in the European area V4 countries remain tourism competitors. In this context, we find it interesting to examine the ability of Slovakia to attract visitors from V4 countries, its destination attractiveness on this target market.

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1. Research Methodology

Whereas there several different literature approaches to the destination attractiveness assessment [9], in the paper, we focus on the Slovakia destination attractiveness examination in terms of demand that overcomes. First, we examine Slovakia's destination attractiveness in terms of Visegrad population demand by exploring the economic approach [9], which takes into account the satisfied demand. With regard to the information availability and the focus on selected target market, our research is based on the statistics 2000–2011, while we recognize its limitations (abstracting from one-day visitors, visitors staying at non-commercial accommodation facilities and illegally, multiple counting of visitors etc.). We focus on administrative units of Slovakia (regions). There is simply a large discrepancy [7] between tourism regions belonging to a group of purposefully created regions and the existing organizational structure of the public sector. Therefore the Statistical Office of the Slovak Republic does not follow them as territorial economic unit.

The most comprehensive indicator of destination attractiveness, which is offered by theory in relation to the economic approach, is the attractive destination index ATD [13]. However, we find it quite challenging as it assumes that the destination attractiveness increases with increasing distance. Furthermore, the ATD index is applicable only when comparing multiple target markets, or when comparing several tourism destinations visited by selected target market. It does not take into account the target market's size (its potential). For purpose of our research, we propose own coefficient (destination attractiveness coefficient) which exceeds all above-mentioned deficiencies and indicates what percentage of the target market total population visited the destination in question (DAC_1), or what proportion of them annually held an overnight stay in the destination DAC_2). The fact, that the coefficient does not take into consideration inhabitants of the target market who did not participate in tourism during the examined period (due to economic, health, family or other reasons) nor those who stayed at friends and relatives or those who were not accommodated in the destination at all (as they visited it during the sightseeing tour of several destinations) may be considered as limiting. However, we find the coefficient relevant as it compares the actual tourism destination visitation with potential visitation with regard to size of target market. The higher the values of the above-mentioned coefficients are, the more attractive the destination in question for the target market is. Coefficients can be calculated according to the following model:

$$DAC_1 = \frac{\sum NV_i}{\sum TMP_i}.100,\ DAC_2 = \frac{\sum NOS_i}{\sum TMP_i}.100, \quad (1)$$

where *DAC* is the destination attractiveness coefficient in terms of selected target markets satisfied demand,

NVi – number of destination visitors coming from the target market during the period i,

NOSi – number of over-night stays of the destination visitors coming from the target market during the period i,

TMPi – target market total population during the period i.

We assume that in foreign tourism, the target markets residents decide about the destination visit within sixty years (life expectancy in Europe is about 75 years, while up to the age of 15 the effective demand actually does not exist). If 100% of the selected emitting market population is about to visit the destination during this period, then it must be visited each year, on average, by 1.67% of target market's population (under ideal condition). With regard to the trend of shorter stays and according to our qualified estimation, the average number of nights spent is three nights (four stay days). Ideally, during the period of 60 years, every citizen of the emitting market should undertake three over-night stays at the destination (in the conversion during the period of 60 years, exactly 300% of the emitting market population should undertake just one over-night stay, i.e. 5% of the population is about to stay over-night in the destination on average per year). Verbal rating scale of the destination attractiveness according to satisfied demand of the Czech Republic, Hungary and Poland is represented in Table 1.

Tab. 1: Values interpretation of DAC_1 and DAC_2 destination attractiveness coefficients in terms of foreign emitting markets satisfied demand

Verbal rating of the destination attractiveness according to economic approach	Percentage value interval of DAC_1, DAC_2 indicators (under ideal conditions)	DAC_1 values in % (calculated from column 2 of the table under ideal conditions 1.67% of the population per year)	DAC_2 values in % (calculated from column 2 of the table under ideal conditions 5% of the population per year)
very unattractive	<0; 30)	$0 \leq DAC_1 < 0.50$	$0 \leq DAC_2 < 1.50$
unattractive	<30; 50)	$0.50 \leq DAC_1 < 0.84$	$1.50 \leq DAC_2 < 2.50$
attractive	<50; 70)	$0.84 \leq DAC_1 < 1.17$	$2.50 \leq DAC_2 < 3.50$
strongly attractive	<70; 90)	$1.17 \leq DAC_1 < 1.50$	$3.50 \leq DAC_2 < 4.50$
extremely attractive	<90; ∞)	$DAC_1 \leq 1.50$	$DAC_2 \leq 4.50$

Source: own elaboration

It is important to evaluate the domestic tourism satisfied demand in a different way. Taking into consideration the data for France, where the domestic tourism is, thanks to the government's support and national pride of the population, a long-term source of employment and income, every Slovak inhabitant should, according to our estimation, participate in domestic tourism on average five stay days annually (in France, each resident participates in domestic tourism more than three times on average, and the average length of stay is more than six days). The interpretation of the values of the destination attractiveness coefficients in terms of satisfied demand in domestic tourism can be found in Table 2.

Whereas individuals who find the destination attractive do not always become its visitors for economic, employment, family and other reasons, we considered it necessary to examine the attractiveness of Slovakia from the perceptual approach as well [9]. This approach takes into consideration potential demand, i.e. the perceived ability of the destination to satisfy specific vacation needs of respondents.

Tab. 2: Values interpretation of DAC_1 and DAC_2 destination attractiveness coefficients in terms of domestic tourism satisfied demand

Verbal rating of the destination attractiveness according to economic approach	Percentage value interval of DAC_1, DAC_2 indicators (under ideal conditions)	DAC_1 values in % (calculated from column 2 of the table under ideal conditions 100% of the population per year)	DAC_2 values in % (calculated from column 2 of the table under ideal conditions 400% of the population per year, resp. length of stay 4 nights)
very unattractive	<0; 30)	$0 \leq DAC_1 < 30$	$0 \leq DAC_2 < 120$
unattractive	<30; 50)	$30 \leq DAC_1 < 50$	$120 \leq DAC_2 < 200$
attractive	<50; 70)	$50 \leq DAC_1 < 70$	$200 \leq DAC_2 < 280$
strongly attractive	<70; 90)	$70 \leq DAC_1 < 90$	$280 \leq DAC_2 < 360$
extremely attractive	<90; ∞)	$DAC_1 \leq 90$	$DAC_2 \leq 360$

Source: own elaboration

The data necessary for evaluation of the perceived attractiveness of Slovakia was obtained by questionnaire survey undertaken from January 2011 to February 2012. The sample consisted of 674 individuals – 333 inhabitants of Slovakia, 118 inhabitants of the Czech Republic, 112 inhabitants of Hungary and 111 inhabitants of Poland; all respondents were over 15 and according to the Chi-square test, they fit the representative picture of the V4

countries population in terms of age (Sig. = 1.000 for Slovak respondents, 0.99 for Czech respondents, 0.75 for Hungarian respondents and 0.994 for Polish respondents) and sex (Sig. = 0.768 for Slovak respondents, 0.920 for Czech respondents, 0.764 for Hungarian respondents and 0.859 for Polish respondents). The final sample was obtained by selection from a total of 1,113 completed questionnaires.

Evaluation procedure of destination attractiveness according to the perceptual approach is most elaborated in scientific literature. We defined the attractiveness of Slovakia by a model used in the study of Hu and Ritchie [3, p. 29]. We added the attractiveness level indicator (LPA), which compares the attractiveness of the tourism destination with a hypothetical assessment of the ideal destination for a selected group of respondents.

Respondents were asked to identify the tourism destination criteria/attributes which mostly affect its attractiveness. Selected touristic attributes related to location, social preconditions, primary and secondary offer of the country were rated on a 5-point Likert scale (1-not at all important, 5-extremely important for its attractiveness). At the same time, they were asked to evaluate the ability of Slovakia to meet their vacation needs related to different attributes. The level of perceived attractiveness of Slovakia (LPA) is then expressed as followed:

$$LPA = \frac{A}{IDA}.100, \qquad (2)$$

where

LPA is the level of perceived attractiveness of the tourism destination,

A – destination attractiveness calculated by multiplying the attributes weights and the ability of Slovakia to meet the potential visitors needs associated with the attributes (according to the model of Hu and Ritchie [3]),

IDA – ideal destination attractiveness calculated by multiplying the attributes weights and maximum values of perceived ability of the destination to meet the needs of potential visitors to various attributes on selected rating scale.

The proportion reflects the extent to which the destination attractiveness corresponds to the hypothetical assessment of ideal destination for a selected group of respondents (while preserving individual attributes weights). Value indicator of the perceived attractiveness level of the destination is interpreted according to Table 3.

Tab. 3: Value interpretation of the destination attractiveness level

Verbal rating of the destination attractiveness	Percentage interval of the destination attractiveness level
very unattractive	<0; 30) = {LPA ⏐ 0 ≤ LPA < 30}
unattractive	<30; 50) = {LPA ⏐ 30 ≤ LPA < 50}
attractive	<50; 70) = {LPA ⏐ 50 ≤ LPA < 70}
strongly attractive	<70; 90) = {LPA ⏐ 70 ≤ LPA < 90}
extremely attractive	<90; ∞) = { LPA ≤ 90 }

Source: own elaboration

Obtained data were processed by mathematic-statistical methods using Excel and SPSS software. We chose the 5% significance level (α = 0.05), i.e. we interpreted the results of statistical testing with 95% probability.

2. Attractiveness of Slovakia in Terms of V4 Countries' Inhabitants Satisfied Demand

V4 countries visitors represent Slovakia's largest tourist group in a long-lasting period, which may be justified by target country's proximity, relatively good awareness of Slovakia as a tourism destination, friends and relatives living in Slovakia, but also by habit to travel to Slovakia in the context of previous limitations of the Eastern Bloc. Since 2000 to 2011, these visitors participated in Slovakia's visitation by almost 80%. Domestic residents (73.2%) significantly dominated the V4 countries tourists' territorial structure, followed by the Czechs (15.8%), Poles (7.9%) and Hungarians (3.1%).

The number of V4 countries tourists in Slovakia, except for the years 2003, 2004, 2009 and 2010, grew by 2.3% per year on average, which is only slightly less than the total number of tourists in Slovakia (2.6% growth). In 2011, compared to 2000, their number increased by almost a quarter (24.1%). Thus the attractiveness of Slovakia in terms of satisfied demand slightly increased.

We examined the dependence of the number of tourists' from the Czech Republic, Hungary and Poland on the exchange rate in the years 2000–2011. We took into account the SKK / CZK, SKK / HUF and SKK / PLN exchange rates, and since 2009 we converted their rate into euros (1 EUR = 30.126 SKK). To prove the dependence, we tested Pearson's correlation coefficient. While in the case of the Czech and Hungarian visitors we did not confirm the dependence (Sig. = 0.76, respectively Sig. = 0.13 ≥ 0.05), in the case of the Polish visitors, a moderate dependence was proved ($\chi^2 = 0.609$, Sig. = 0.022 < 0.05). With 95% probability, we can assume that with a stronger zloty the number of the Polish visitors in Slovakia is increasing. We underline the fact that the Polish visitors are sensitive to the price of services and destinations can attract them thanks to a suitable price policy.

During the examined period, V4 countries' tourists participated by 79.9% in the total number of nights spent in the Slovak accommodation facilities. The largest share of overnight stays belongs to the Slovaks (74%), followed by the Czechs, Poles and Hungarians. Permanent beds in accommodation facilities were used up to 19.1% (overall capacity utilization in 2000–2011 was 23.9%). Slovak tourists used it to 14.1%, Czech tourists to 3%, Hungarian tourists to 0.5% and Polish tourists to 1.5%.

In 2000–2011, the average length of stay of V4 countries' tourists was 4.3 days, which is identical with the total average length of stay of all tourists in Slovakia. On average, the highest number of stay-days was spent by domestic visitors (4.3) and the smallest number by Hungarian tourists (3.7). The V4 countries' tourists spent the longest time in Banská Bystrica region (4.9 days), Trnava region (4.9 days) and Prešov region (4.7 days). On the other hand they spent the shortest time in Bratislava region (3.1 days), which is traditionally visited in short-time tourism because of the capital (prolonged weekends, business tourism). According to the global trends, the average length of stay of V4 countries' tourists shortened during 2000–2011 up to one sixth (15.4%), which is less than nation-wide average (17.1%). As a result of bad economic situation, Hungarian visitors shortened their stays most significantly (up to 18.8%) and Czech visitors the least (up to 5.2%).

According to Pearson correlation coefficient, the length of stay in the Slovak accommodation facilities prolongs with strengthening national currencies of Czech residents ($\chi^2 = 0.58$, Sig. = 0.046 < 0.05), Hungarian residents ($\chi^2 = 0.88$, Sig. = 0.00 < 0.05) and Polish residents ($\chi^2 = 0.95$, Sig. = 0.00 < 0.05). The strongest correlation was noted in the case of Polish (significant influence of exchange rate on the number of tourists, number of over-night stays and length of stay), moderate correlation can be expressed in the case of Hungarians (influence on the number of over-night stays and length of stay) and the lowest correlation is observed among Czechs (influence on length of stay). We assume that Slovakia's attractiveness in terms of satisfied demand of these target markets is determined by the exchange rates.

If we take the target market size (number of V4 countries' inhabitants and therefore number of potential visitors of Slovakia coming from these target markets) into consideration, then we can assume that in 2000–2011 Slovakia was attractive to 4.3% of V4 countries inhabitants, who visited it once a year on average. And, at the same time, it was attractive to 14% of V4 countries inhabitants who spent one over-night stay in Slovakia on average. This means that every V4 countries' resident visits Slovakia once in 23 years on average or that in more than 7 years, the whole V4 population spends one over-night stay in Slovakia on average.

Tab. 4: Average values of DAC_1 attractiveness coefficient of Slovakia in terms of satisfied demand of V4 countries inhabitants

Year/ Territory	BSK	TTSK	TSK	NSK	ŽSK	BBSK	PSK	KSK	SR
2000	0.57	0.24	0.25	0.25	0.64	0.48	0.78	0.34	3.54
2001	0.62	0.29	0.30	0.28	0.75	0.55	0.92	0.37	4.07
2002	0.68	0.31	0.34	0.27	0.83	0.60	0.98	0.45	4.46
2003	0.67	0.30	0.35	0.28	0.85	0.58	0.90	0.41	4.34
2004	0.66	0.28	0.33	0.25	0.78	0.54	0.77	0.39	4.00
2005	0.69	0.28	0.33	0.28	0.84	0.56	0.78	0.40	4.16
2006	0.73	0.28	0.35	0.29	0.88	0.59	0.81	0.40	4.34
2007	0.77	0.29	0.39	0.29	0.94	0.59	0.88	0.43	4.57
2008	0.81	0.33	0.43	0.35	1.07	0.64	0.97	0.48	5.08
2009	0.70	0.26	0.37	0.33	0.89	0.52	0.79	0.39	4.26
2010	0.67	0.28	0.34	0.32	0.92	0.52	0.81	0.37	4.23
2011	0.74	0.29	0.33	0.30	1.01	0.52	0.82	0.38	4.39

Source: own elaboration based on Statistical Office of the Slovak Republic sources [14]

Note: BSK – Bratislava region, TTSK – Trnava region, TSK – Trenčín region, NSK – Nitra region, ŽSK – Žilina region, BBSK – Banská Bystrica region, PSK – Prešov region, KSK – Košice region, SR – Slovak Republic.

Tab. 5: Average values of DAC_2 attractiveness coefficient of Slovakia in terms of satisfied demand of V4 countries inhabitants

Year/ Territory	BSK	TTSK	TSK	NSK	ŽSK	BBSK	PSK	KSK	SR
2000	1.20	1.18	0.91	0.69	2.63	2.31	3.54	0.85	13.31
2001	1.23	1.16	1.03	0.83	2.94	2.38	3.88	0.91	14.35
2002	1.37	1.25	1.38	0.79	3.01	2.56	4.06	1.14	15.56
2003	1.41	1.27	1.45	0.86	3.02	2.52	3.74	1.02	15.29
2004	1.29	1.08	1.18	0.79	2.69	2.15	3.02	0.91	13.11
2005	1.52	1.01	1.12	0.75	2.78	1.97	2.72	0.91	12.78
2006	1.56	1.07	1.22	0.84	2.99	2.03	2.84	0.87	13.41
2007	1.61	1.08	1.40	0.82	3.18	2.07	2.96	0.94	14.06
2008	1.80	1.19	1.59	1.01	3.54	2.29	3.21	1.10	15.73
2009	1.56	0.97	1.41	0.89	2.96	1.95	2.71	0.87	13.32
2010	1.46	1.01	1.32	0.93	3.01	1.94	2.75	0.80	13.22
2011	1.58	1.00	1.24	0.85	3.12	1.95	2.75	0.79	13.29

Source: own elaboration based on Statistical Office of the Slovak Republic sources [14]

Note: BSK – Bratislava region, TTSK – Trnava region, TSK – Trenčín region, NSK – Nitra region, ŽSK – Žilina region, BBSK – Banská Bystrica region, PSK – Prešov region, KSK – Košice region, SR – Slovak Republic.

We compared obtained results to the results of sub-task of the scientific project VEGA 1/4572/07 „Theoretical and methodological aspects of tourism development under conditions of globalization and internationalization". The sub-task in question focused on the attractiveness evaluation of Slovakia as a tourism destination to the European Francophone countries. The comparison proved significant differences. In 2000–2008, Slovakia was attractive to less than 0.1% of Francophone states' residents who visited it per year on average, and only to 0.2% of such a target market inhabitants who spent one over-night stay per year [10]. The difference emerges from absenting general awareness about Slovakia as a tourism destination, higher distance, and insufficient information accessibility about the tourism destination, worse transport accessibility and the Francophone visitors' expectation of higher quality of tourism services.

The destination attractiveness of Slovakia in terms of satisfied demand is strongly differentiated in each target market. From this aspect, Slovakia is attractive to more than one third of domestic inhabitants who accommodated during the examined period in its territory (DAC_1=37.2). This means that on average every Slovak citizen participates in domestic tourism in 2.7 years. Despite such relatively positive values, we evaluate Slovakia in terms of domestic inhabitants' satisfied demand as unattractive according to the table 2 ($30 \leq DAC_1 < 50$).

As DAC_1 coefficient does not take into consideration the length of stay in a destination, which tells us a lot about the destination's attractiveness, and it does not pay attention to the multiple tourists counting neither (in the case of stays at several accommodation facilities), we find the DAC_2 coefficient more relevant when evaluating destination attractiveness in terms of satisfied demand. We take it as decisive (table 5).

When expressing the relation of the number of over-night stays of domestic tourists and number of inhabitants of Slovakia, we can assume that on average every citizen undertook more than one over-night stay in Slovakia per year (DAC_2=122.3). More than one fourth of Slovaks (26.7%) spent on average one night at the accommodation facilities in the region of Prešov per year, 22.7% of them in Banská Bystrica region and 22.3% in Žilina region. Even according to the DAC_2 coefficient, Slovakia as a tourism destination is unattractive in terms of domestic inhabitants' satisfied demand ($120 \leq DAC_2 < 200$). Therefore, it is necessary to increase domestic tourism demand. When following the premise about domestic tourism as source of foreign tourism development in state and when comparing current situation in Slovakia to the position of domestic tourism in the most visited country in the world (France), we have to argue in favour of every economic and non-economic tool of its support.

During the examined period, Slovakia remained extremely attractive to the Czech inhabitants ($DAC_1 \leq 1.50$, $DAC_2 \leq 4.50$). It was visited on average by 4.2% of Czech population per year (every Czech visits Slovakia in almost 24 years), and 13.6% undertook one over-night stay per year in Slovakia (100% of Czech population spend one over-night stay in Slovakia in 7.4 years).

In 2000- 2011, Slovakia was attractive only to 0.9% of Hungarian inhabitants, which proves its low attractiveness ($0.84 \leq DAC_1 < 1.17$). Every Hungarian visits Slovakia on average in 111 years. 2.3% of Hungarian population spent on average one over- night stay in Slovakia per year. According to more decisive DAC_2 coefficient, Slovakia is unattractive to Hungarian inhabitants in terms of satisfied demand ($1.50 \leq DAC_2 < 2.50$). On average, every Hungarian spends exactly one over-night stay in 43.5 years in Slovak territory.

In relation to the size of Polish population, Slovakia was attractive only to 0.6% of Poles who visited it on average per year in 2000–2011. Respectively, it was attractive to 1.8% of the inhabitants who spent an over-night stay per year in its territory. It is obvious that, on average, every Polish inhabitant visits Slovakia in 166.7 years or spends one over-night stay in 55.6 years. Slovakia is unattractive to the Polish visitors in terms of satisfied demand ($0.50 \leq DAC_1 < 0.84$; $1.50 \leq DAC_2 < 2.50$).

As proved by attractiveness evaluation of Slovakia from the point of view of Francophone states' inhabitants [10], the destination attractiveness in terms of satisfied demand does not have to match its subjective evaluation. In the following part of this paper, we evaluate the attractiveness of Slovakia perceived by V4 countries inhabitants.

Tab. 6: Attractiveness level of Slovakia in dependence on the respondents' country of origin in %

Attribute/ Values	Slovakia	Czech Republic	Hungary	Poland	V4
attributes relating to the destination location	*69.66*	*85.27*	*90.32*	*86.91*	*79.05*
thereof:					
- destination accessibility	66.72	84.53	86.43	85.32	75.94
- destination distance	73.46	85.99	94.42	90.86	82.62
attributes relating to the destination social preconditions	*62.97*	*69.09*	*70.09*	*75.79*	*67.71*
thereof:					
- safety of tourist and their possession	65.18	77.23	80.98	90.89	74.30
- price level	54.57	67.88	80.09	76.38	64.71
- national gastronomy	74.25	76.22	80.88	78.11	76.32
- local's attitude toward tourists	62.30	75.47	73.63	95.06	72.78
- ability of locals to communicate in visitors' language	89.98	79.03	65.55	85.53	83.86
- ability of locals to communicate in English	53.51	59.41	55.77	63.75	56.23
- ability of locals to communicate in German	46.57	53.87	58.26	60.31	51.10
destination primary offer attributes	*76.93*	*73.04*	*72.53*	*68.07*	*73.41*
thereof:					
- climate	73.61	67.65	81.34	79.37	75.26
- natural beauties	89.95	86.31	89.21	85.61	88.40
- historical attractions	79.67	74.90	68.82	62.32	75.01
- architectural monuments	84.11	79.73	74.96	68.29	79.60
- museums, cultural attractions	70.37	71.19	63.79	64.68	68.71
- organized events	67.94	69.27	60.71	66.24	66.73
- uniqueness of local people's life	66.15	66.74	76.03	70.49	68.65
destination secondary offer attributes	*64.54*	*69.95*	*71.13*	78.08	*68.90*
thereof:					
- information accessibility	58.44	73.81	71.84	77.26	66.15
- transportation infrastructure	52.94	69.95	69.64	71.73	61.73
- shopping opportunities	64.56	67.40	72.43	71.42	68.25
- sport and recreational opportunities and activities	71.57	75.34	81.84	90.56	77.65
- theme parks, aqua parks	69.83	70.24	69.18	86.65	72.90
- entertainments	64.83	65.10	64.47	64.31	64.34
- accommodations	68.93	71.07	74.55	86.41	73.41
- restaurants	67.86	71.05	74.75	86.49	72.62
Total	*68.70*	*71.59*	*72.61*	*74.75*	*70.29*

Source: own elaboration

3. Perceived Attractiveness of Slovakia from the Point of View of V4 Countries Inhabitants

In the next step of the research, V4 countries respondents were asked to evaluate the attributes affecting destination attractiveness. According to Friedman and Wilcox test, there is no significant difference between the first two groups of attributes (location, secondary offer). A difference was statistically confirmed only between the attributes on the third (primary offer) and the fourth place (social preconditions). The results of primary research, as well as the results of the attractiveness evaluation of Slovakia for the French-speaking population [10], confirmed the premise of a wider impact of the tourism destination location than of the primary offer on the territory attractiveness [4].

According to the respondents, Slovakia is widely capable to satisfy their needs related to location (distance and transport accessibility) and primary offer, while it is less capable to satisfy their needs related to secondary offer and social preconditions. Taking into consideration the importance of each attribute and the evaluation of Slovakia's ability to meet potential visitors' needs related to these attributes, we propose that in contrary to general acknowledgement of low quality services, what appears to be most attractive in Slovakia is the secondary offer, followed by location, primary offer and social preconditions of the country (Table 6). The ranking is influenced by domestic inhabitants' evaluations. The requirements of the other V4 countries respondents are fulfilled by Slovakia's location as a tourism destination, or its proximity and transport accessibility. Despite strong associations of Slovakia to natural beauties, Polish respondents are not satisfied with country's primary offer.

According to Friedman and Wilcox tests, relatively most attractive within each criteria are (1) natural beauties of Slovakia (geomorphological conditions, fauna and flora, lakes and rivers proximity, mineral and thermal springs, waterfalls, caves etc.) followed by (2) sport-recreational facilities and, architectonical monuments, accommodation facilities, transport accessibility of the country, or each tourism centre and safety of visitors and their propriety which attend the second place together. Furthermore, according to Rapacz [11] we can define Slovakia as a universally attractive tourism destination with general natural, cultural and infrastructure preconditions attractive to visitors and appropriate for development of various types of tourism (recreational, sport-adventurous, cultural, etc.).

On the other hand V4 countries potential visitors are not satisfied with shopping opportunities, entertainment and social services facilities, and with the capability of locals to communicate in foreign language (English and German). This may result from the respondents' ability to communicate with the locals in their mother tongue (proximity of Slavic languages, numerous Hungarian national minority living in Slovakia). In comparison to the results of project VEGA 1/4572/07 sub-task, we underline the fact that Slovakia is most unattractive to Francophone visitors in terms of destination information accessibility.

With reliability of 95%, we can presume that the citizens of V4 countries perceive Slovakia's attractiveness between 69.7% and 71 %, which, according to table 3, represents the existing or strong attractiveness. As the results of project VEGA 1/4572/07 sub-task proved attractiveness of Slovakia (attractiveness level of 57.2%) [10], we can assume that a negative correlation exists between geographic distance and perceived attractiveness of a destination.

We can observe little differences among citizens of each V4 country. A low dependence between the country of origin and perceived attractiveness of Slovakia as a tourism destination was proved by Spearman coefficient ($r=-0.15$, $Sig.=0.00<0.05$).

With reliability of 95%, Slovak visitors perceive their own country's attractiveness between 67.3% and 69.1%, which reflects an existing attractiveness. Czech inhabitants evaluate it between 69.5% and 72.7% (from attractive to strongly attractive) and according to Hungarian inhabitants, Slovakia's destination attractiveness level is between 70.3% and 73.7% (strong attractiveness). Evidently, Slovakia remains the most attractive to Polish inhabitants, who find it extremely attractive (destination attractiveness level between 72.3% and 75.8%). When comparing the results for each V4 country (average destination attractiveness level is equivalent to 70.3%), it is obvious that domestic inhabitants evaluate Slovakia's destination attractiveness the worst.

We examined the dependence of perceived destination attractiveness on existing family liaisons and friends living in Slovakia separately for Czech, Hungarian and Polish respondents. However, Spearman coefficient did not prove such a dependence (Sig.=0.165≥0.05). Thus, we cannot prove that the perceived attractiveness of Slovakia is influenced by the emotional ties to this country.

Conclusion

We examined Slovakia's destination attractiveness in terms of satisfied and potential demand. The inhabitants of Slovakia, Hungary and Poland find Slovakia much more attractive from the point of view of perceived destination attractiveness than in terms of satisfied demand attractiveness. Thus, there is a large gap for visitation increase, but also for perception improvement of Slovakia as a tourism destination. In the case of Czech market, the attractiveness of Slovakia in terms of satisfied demand is very strong, and it is necessary to maintain this positive fact. In this connection the innovations oriented to the respect of cultural differences may be decisive [1].

Attractiveness evaluation of Slovakia in terms of selected target market (which contributes to Slovakia's visitation up to 80%) and its further comparison with the sub-task results of VEGA 1/4572/07 project "Theoretical and methodological aspects of tourism development under conditions of globalization and internationalization" evaluating the attractiveness of Slovakia as a tourism destination for European Francophone countries, leads us to formulate the following generalizations:

- Without broad general awareness and created image of a unique tourism destination, the destination attractiveness decreases with increasing distance from the target market.
- The destination attractiveness remains identical in terms of supply and demand for the target market with relatively good general knowledge of the tourism destination; however, in case of a less well-known destination this is not valid.
- Destination location has a greater impact on its attractiveness than its tourism primary offer.
- Slovakia as a tourism destination holds universal attractiveness; it is likely to meet visitors' diverse needs associated with various types of tourism.
- Destination attractiveness in terms of satisfied demand is affected by economic factors.
- Increase of tourism destination visitation (namely its attractiveness in terms of satisfied demand) and related achievement of positive economic effects, is conditioned by favourable destination perception of selected target market.
- Destination attractiveness of Slovakia in terms of visitors' satisfied demand can be increased thanks to tourism offer adaptation and its presentation to the demand side.

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References

[1] BRUNET-THORTON, R., BUREŠ, V. Cross-cultural management: Establishing a Czech benchmark. *E+M Ekonomie a Management.* 2012, Vol. 15, No. 3, pp. 46-62. ISSN 1212-3609.

[2] GÚČIK, M. Cestovný ruch v regionálnom rozvoji. In GÚČIK, M. et al. *Manažment cieľového miesta cestovného ruchu.* Knižnica cestovného ruchu 21. Banská Bystrica: Slovak-Swiss Tourism, 2012. ISBN 978-80-8141-025-3.

[3] HU, Y., RITCHIE, B.J.R. Mesuring destination attractiveness. A contextual approach. *Journal of Travel Research.* 1983, Vol. 32, No. 2, pp. 25-34. ISSN 0047-2875.

[4] KOPŠO, E. et al. *Geografia cestovného ruchu.* Bratislava: Slovenské pedagogické nakladateľstvo, 1992. ISBN 80-08-00346-4.

[5] KOTLER, P., BOWEN, J., MAKENS, J. *Marketing for hospitality and tourism.* 3rd ed. New Jersey: Pearson Education International, 2003. ISBN 0-13-120057-7.

[6] KROGMANN, A. Katedra geografie a regionálneho rozvoja. Fakulta prírodných vied Univerzity Konštantina Filozofa v Nitre. 27-28. októbra 2009.

[7] KUČEROVÁ, J., MAKOVNÍK, T. Regional tourism policy in Slovakia. *E+M Ekonomie a Management.* 2009, Vol. 12, Iss. 1, pp. 6-13. ISSN 1212-3609.

[8] MARROCU, E., PACI, R. Different tourists to different destinations. Evidence from spatial interaction models. *Tourism Management*. 2013, Vol. 39, No. 6, pp. 71-83. ISSN 0261-5177.
[9] POMPUROVÁ, K. Atraktívnosť Slovenska pre vybraný segment návštevníkov. *E+M Ekonomie a Management.* 2011, Vol. 14, No. 2, pp. 137-150. ISSN 1212-3609.
[10] POMPUROVÁ, K. Atraktívnosť Slovenska v cestovnom ruchu pre obyvateľov Belgicka, Francúzska, Luxemburska a Švajčiarska. In *Folia turistica 1. Zborník vedeckých prác.* Banská Bystrica: Slovak-Swiss Tourism, 2010. pp. 171-184. ISBN 978-80-89090-77-8.
[11] RAPACZ, A. The impact of innovation on establishing selected Lower Silesian tourist destinations attractiveness. In *Folia Turistica 2. Zborník vedeckých prác.* Banská Bystrica: UMB-Ekonomická fakulta, 2012. pp. 311-317. ISBN 978-80-557-0351-0.
[12] Travel & tourism economic impact 2012. Slovakia [online]. World Travel & Tourism Council, 2013 [cit. 2012-06-11]. 24 p. (PDF). Available from: http://www.wttc.org/site_media/uploads/downloads/slovakia2012.pdf.
[13] VANÍČEK, J. *Marketingový výzkum a měření atraktivity turistické destinace* [online]. Praha: Česká marketingová společnost, 2007 [cit. 2009-02-23]. Available from: http://www.mandk.cz/view.php?cisloclanku=2007010009.
[14] *Visitors in tourism accommodation establishments in the Slovak Republic by regions.* Unpublished information of Statistical Office of the Slovak Republic from the period of years 2000–2011. Bartislava: Statistical Office of the Slovak Republic, 2012.

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Abstract

DESTINATION ATTRACTIVENESS OF SLOVAKIA: PERSPECTIVES OF DEMAND FROM MAJOR TOURISM SOURCE MARKETS

Kristína Pompurová, Ivana Šimočková

The destination attractiveness is an expression of territory attractiveness in relation to the decision-making process of its visitors. It plays a key role in determination of destination's competitive advantage; subsequently it influences the economic effects resulting from goods and services consumption in its territory. In scientific literature a significant attention has been paid to this concept for several decades.

The aim of this paper was to examine destination attractiveness of Slovakia in terms of the most important tourism source markets demand – Visegrad countries' inhabitants, representing 80% share of the overall visitation of Slovakia.

The attractiveness analysis results in terms of satisfied demand suggest that Slovakia is attractive to 4% of the V4 countries' population who visit it on average once a year, that is, to 14% of the V4 countries' population, who undertake one over-night stay per year on average. Slovakia is extremely attractive to the Czechs thanks to its proximity, common political history and non-existing language barrier; however, it remains unattractive to other V4 countries inhabitants.

In terms of potential demand, Slovakia meets the ideal destination expectations of 70–71% of V4 countries population, which means it is strongly attractive to them. The Poles find it the most attractive while Hungarian and Czech residents find it less attractive. Slovakia's own inhabitants appreciate this tourism destination the least. They particularly criticize lack of quality services, negative attitude toward customers and high prices which do not correspond with the quality of services. Slovak respondents find the natural beauties of their own country most attractive. Such an evaluation is common for the Czech and Hungarian respondents too. According to the Polish respondents, the most attractive in Slovakia is the positive attitude of local population. They evaluate sports and recreational facilities and activities extremely positively.

The inhabitants of Slovakia, Hungary and Poland find Slovakia much more attractive from the point of view of perceived destination attractiveness than in terms of satisfied demand attractiveness. Thus, there is a large gap for visitation increase, but also for perception improvement of Slovakia as a tourism destination. In the case of the Czech market, the attractiveness of Slovakia in terms of satisfied demand is very strong, and it is necessary to maintain this positive fact. In this connection the innovations and their promotion on relevant markets may be decisive. And thus the position of tourism as a tool for economic, social and cultural development of the country can be enhanced.

Key Words: *Destination attractiveness, demand, V4 Group countries, Slovakia.*

JEL Classification: *L83, M31, D7.*

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THE COSTS AND REIMBURSEMENTS FOR LUNG CANCER TREATMENT AMONG SELECTED HEALTH CARE PROVIDERS IN THE CZECH REPUBLIC

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Introduction

Lung cancer is the most frequently diagnosed oncologic disease worldwide. It is annually diagnosed in nearly 1.4 million patients. It is also the most frequent cause of cancer related deaths [32]. In the Czech Republic, lung cancer occupies a leading position both in the rate of incidence and the mortality rate. In men, it is the second most common oncologic disease after prostate cancer, while in women it assumes third position after breast and colon cancer [31]. Lung (bronchogenic) carcinoma are generally divided into two basic types: a group of non-small-cell lung cancers (NSCLC), which contributes to the total number of lung cancers at the level of 75 to 80%, and the small-cell lung cancer (SCLC) accounting for the remaining 20 to 25%. Both types differ from each other in regard to the biological behaviour and prognosis, as well as the treatment strategy [30], [31]. In 2010, the incidence of this disease in men was 89.7 per hundred thousand people (it was 102.3 in 1996), while in women it was 35.2 per hundred thousand people (against 22.9 in 1996). The severity of the disease is also reflected by the high mortality rate which was 74.8 per hundred thousand people in men in 2010 (87.9 in 1996) and 27.4 per hundred thousand people in women (19.5 in 1996) [28].

Cancer costs the EU are estimated as 126 billion EUR in 2009, with health care accounting for 51 billion EUR. Lung cancer had the highest economics cost 18.8 billion EUR. [11]. Up until this point (second part of the year 2013), no comprehensive study of healthcare costs for lung cancer treatment in all stages of the illness has been published in the Czech Republic. The main object of this study is to make an assessment of therapy related costs from the payers' (health insurance funds) and the healthcare providers' (hospitals) perspective based on some available and identifiable data from three out of total thirteen Complex Oncology Centres in the Czech Republic, namely Brno, Hradec Králové and Plzeň, where the treatment standards were set up [5], [20], [21], [30].

Several international studies have been carried out in the European context using, as a rule, so-called treatment algorithms for the determination of therapeutic costs [1]. Based on these algorithms, prices were successively analysed applying mainly the analysis of reimbursements based on DRG or on published reimbursement lists [14], [25], [29]. All the studies mentioned here are based on cost estimates. German study assessing the social costs employed the principle based on assessing the rate of human capital. The total costs, including the absenteeism costs, were thereby assessed. [27]. A retrospective study carried out in the Netherlands assessed costs from the initial diagnosis to subsequent death or to the end of the assessment period. It included the length of hospital stays, the types and number of diagnostic procedures involved and some information concerning radiotherapy and chemotherapy [23]. A very widespread approach is the assessment of treatment in a particular stage [1]. The authors of a study on this topic carried out in Switzerland came to the

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conclusion that a hospital stay is inexpedient in terms of cost effectiveness [9]. In the UK and the US, the so-called global studies analyse also the social costs of lung cancer [4]. The most extensive study of this type was published in the USA, by means of the application of diagnostic and therapeutic algorithms, the results of which were supported by data from a group of over 2,000 patients [15]. A study written in Thailand, describes a sample group of 96% of all patients with lung cancer registered there in 2010. The treatment costs were subdivided according to three schemes currently employed in Thailand for healthcare reimbursement [22].

According to Cipriano et al. [6], the monthly treatment costs for a 72-year-old patient diagnosed with lung cancer in 2000, ranged from USD 2,687 (no active treatment) to USD 9,360 (chemo-radiotherapy) in the first 6 months; costs varied by stage at diagnosis and histologic type.

Vergnenègre et al [29] used a sample from public and private hospitals treating large numbers of patients. The study covered the period from 1 July 1998 to 30 June 1999, and was based on medical chart review. A Markov model with six decision trees (two for small cell lung cancer [SCLC] and four for non-small cell lung cancer [NSCLC]) was used for the cost analysis. The treatment was broken down into first-line and second-line strategies, surveillance, and terminal care (TC). The resulted average management costs were EUR 22,006 (EUR 10,631–36,296) for 1 year and EUR 25,643 (EUR 10,631–41,191) for 2 years. The 2-year average costs were EUR 22,420 for disseminated SCLC and EUR 27,098 for localized SCLC. The costs of NSCLC ranged from EUR 19,543 for nonsurgical stages to EUR 30,024 for surgical stages, and to EUR 24,383 for stage IV. The weight of the different components of each strategy differed markedly according to the diagnostic subgroup: the cost of diagnosis ranged from 7.4% to 14% of the total management costs, and that of TC ranged from 11.5% to 31.1%. The principal cost component was the first-line chemotherapy (32–58.5%). Sensitivity analyses showed that, whatever the type of lung cancer, the percentage of actively treated patients was the main cost determinant. TC and chemotherapeutic lines also had important economic implications.

Dedes et al. [9] concluded that for the entire patient sample in his study, the mean cost per patient was EUR 19,408 (median EUR 14,691, range EUR 1,821–80,020), 71% of which was due to the hospitalisation costs. The mean cost per a NSCLC patient was EUR 19,212 (median EUR 14,511, range EUR 1,821–80,020), and per a SCLC patient it was EUR 20,992 (median EUR 15,367, range EUR 5,282–51,840).

Wolstenholme and Whynes [33] published a detailed patient-by-patient cost analysis based on case records for 253 patients diagnosed in 1993, revealing that the mean 4-year diagnosis and treatment costs amounted to GBP 6,150 and GBP 5,668 for non-small cell and small cell lung cancer resp. These costs are lower than those identified in Canadian studies, the difference being explained by the use of simulated costing methodology, lower unit costs, and less aggressive interventions.

Zeng et al [34] calculated the mean cost of treatment for PFS and DPS patients; over one year it was approximately USD 11,566 and USD 14,519, respectively. The monthly costs for all patients were higher initially than in the subsequent months (PFS: USD 2,490; DPS: USD 2,503). For PFS patients, healthcare expenditures stabilised after the 7th month, with the mean monthly medical expenditure of USD 82.49. For DPS patients, expenditures stabilised after the 9th month, and the mean expenditure during the 9th month was USD 307.9. Medical care costs in the three successive months prior to death were USD 3,754, USD 5,829 and USD 7,372, respectively.

The majority of economic studies devoted to lung cancer include only direct costs using either simple cost-minimisation analyses, or complex cost-benefit analyses [3], [17]. Specific eligible costs vary between individual studies and countries. The underlying reasons may be seen in different data sources, a different organisation of the health care system, its financing and reimbursements [17]. The studies vary also e.g. according to the respective patients' populations, the types of analyses, approaches or time horizons, or by the afore mentioned type of costs involved [4].

An OECD study published in 2013 summarised that cancer currently consumes around 5% of all health care costs. Increasing incidence, prolonged survival, and high costs of novel drugs and technologies mean that growth

in spending on cancer is outstripping growth in total health expenditure. Cancer patients and their carers also bear significant costs, both financial and social. Once these are taken into account, the global economic impact of premature death and disability from cancer is around USD 900 billion, larger than that for heart disease, [19]. The conclusions of the OECD report are based on estimates of health care related cost data. This is considered a problem based in unavailability of actual data, and the report stresses the importance to move towards an implementation of disease specific health accounts in the future.

In Europe it is generally accepted that the cost assessment should be left to the national bodies, while the outcomes can be shared, as they are usually results of a multi-centre randomized controlled trial. E.g. the panel of V4 experts [10] concluded in December 2011 that "... HTA decision making should be left to the national level. This is due to varying standards, costs, traditions and values." Also the study carried out by Schiller et al. [25] concluded that differences in healthcare systems cause that the results of cost/financial analyses may not be generalizable to all countries/settings.

1. Methods and Sources of Data

Based on the analysis of the studies above, a methodology was set up with the objective of assessing costs for lung cancer treatment, both from the payers' and the healthcare providers' perspectives. In the Czech Republic a similar methodology was used in the study dealing with costs of type II diabetes in 2009 [12]. We also followed the methodological recommendations formulated by the 2013 Report of the ISPOR Health Economic Evaluation Publication Guidelines Good Reporting Practices Task Force. [13]

The costs spent in the Czech Republic by the payer (health insurance funds) may be calculated on the basis of publicly accessible data, i.e. particularly the Decree No. 134/1998 Coll., which issues the list of medical procedures with their point values [8]. This decree is annually updated, and the calculations in this study are based on some relevant data for 2013. The calculations using DRG codes are based on information published on the website of the National Reference Centre (NRC). It primarily includes the codebook of relative weights and the list of general tariffs of the costs for services [18]. For the purposes of the lung cancer therapy calculation, the calculations were made excluding complications and comorbidities (hereinafter CC). The costs of pharmaceuticals were included in all models. Just in the case of hospital overhead estimations, these costs were omitted due to the danger of possible overestimation of the hospital total overhead costs. In bronchogenic carcinoma, complications and associated diseases are highly individual and their costs must be monitored separately so they were excluded from the calculations. In the case of chemotherapy, it must be said that all costs for pharmaceuticals (including biological therapy) are paid separately and, therefore, they are included in individual calculations in this way.

It is, however, much more difficult to identify the costs spent by the health care provider, as the majority of hospitals and health care facilities work with cost related data in the "confidential" mode. For the purposes of this study, these costs were estimated and verified based on expert opinions of pulmonologists, oncologists, head physicians and staff members of technical and economic departments of two pneumo-oncologic centres and three university hospitals in the Czech Republic. Interviews with experts were conducted in the period from November 2012 to February 2013 based on diagnostic and therapeutic algorithms (whose selection is described in the part Results) thanks to which costs for individual interventions were specified. To attain the total costs, overhead costs had to be added. Based on consultations with experts, overhead costs were additionally calculated to include all costs, excluding drugs, i.e. mainly chemotherapeutics and biological drugs. These pharmaceuticals (primarily biological drugs) form the dominant part of costs in numerous therapeutic procedures. If overhead costs were added to them, some results would arise and be unlikely costs for therapy. In the final consequence, the real situation would not be reflected in this way.

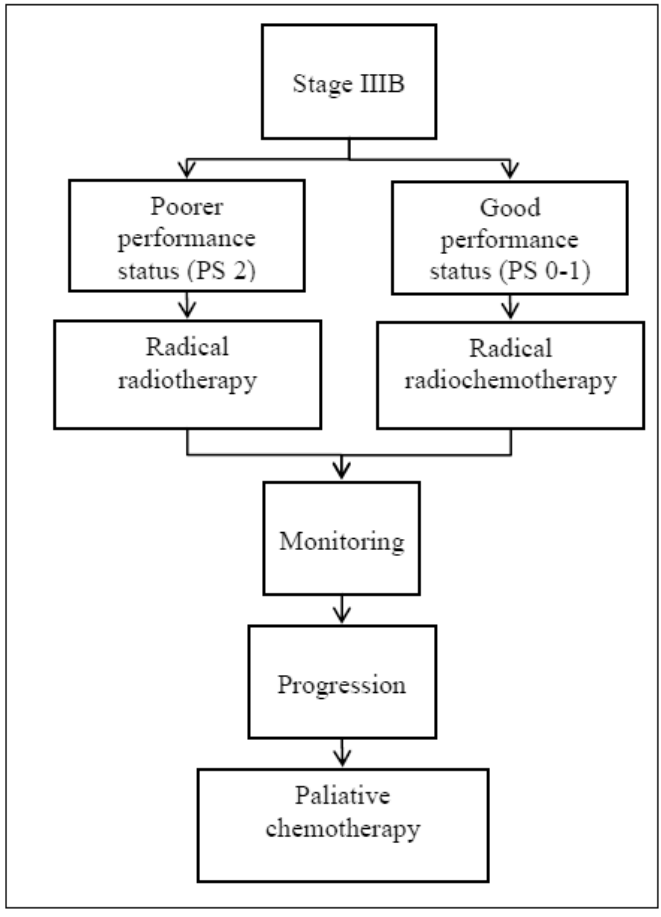
The times of interventions are stated in accordance with the data published in the lists of procedures with point values for individual medical branches [2], [8]. The salaries of medical staff are calculated based on average salaries and wages for 2011 published by the Institute of Health Information and Statistics of

the Czech Republic [16] (the latest data released to date).

The calculated costs were noted directly into the process maps; see an example in Figs. 1–3. The first figure presents all options of the therapeutic scheme for the stage IIIB. Here, individual calculations are not described for the reason that they are specified in the following therapeutic paths that follow from the basic chart. Thus, the maps below (Fig. 2 and Fig. 3) display two different paths that the clinician may select during the treatment of bronchogenic carcinoma in stage IIIB. In them, the costs for the individual steps are already demonstrated. If the schemes include a step without the accompanying calculated costs, it is not a therapeutic procedure. In this stage, it is an intermediate step due to diagnostics. The costs for these diagnostics are negligible if compared with the costs for treatment as such.

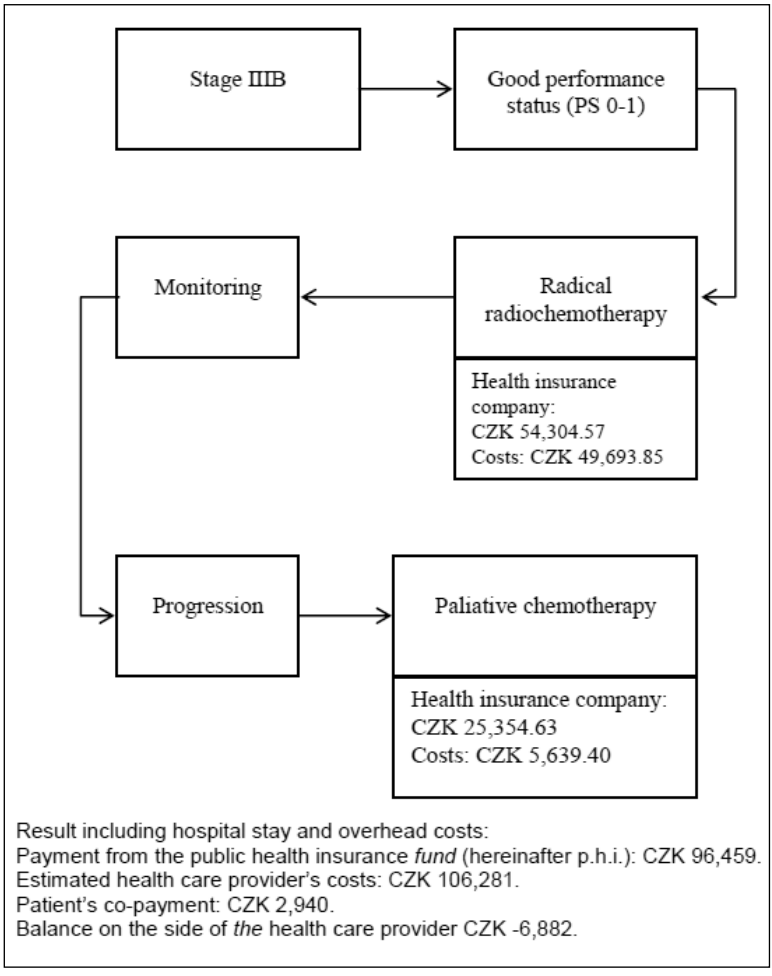
All the data are expressed in Czech Crowns (CZK). The CZK exchange rate ranged between 25–26 CZK to EUR, or 19–20 CZK to USD during the previous year [7]. All monetary data were rounded to the nearest crown.

Fig. 1: Non-small-cell type of lung cancer – stage IIIB; basic chart



Source: Authors' design based on recommended therapeutic procedures [5], [20], [21], [30]

Fig. 2: **Non-small-cell type of lung cancer – first therapeutic path for stage IIIB**



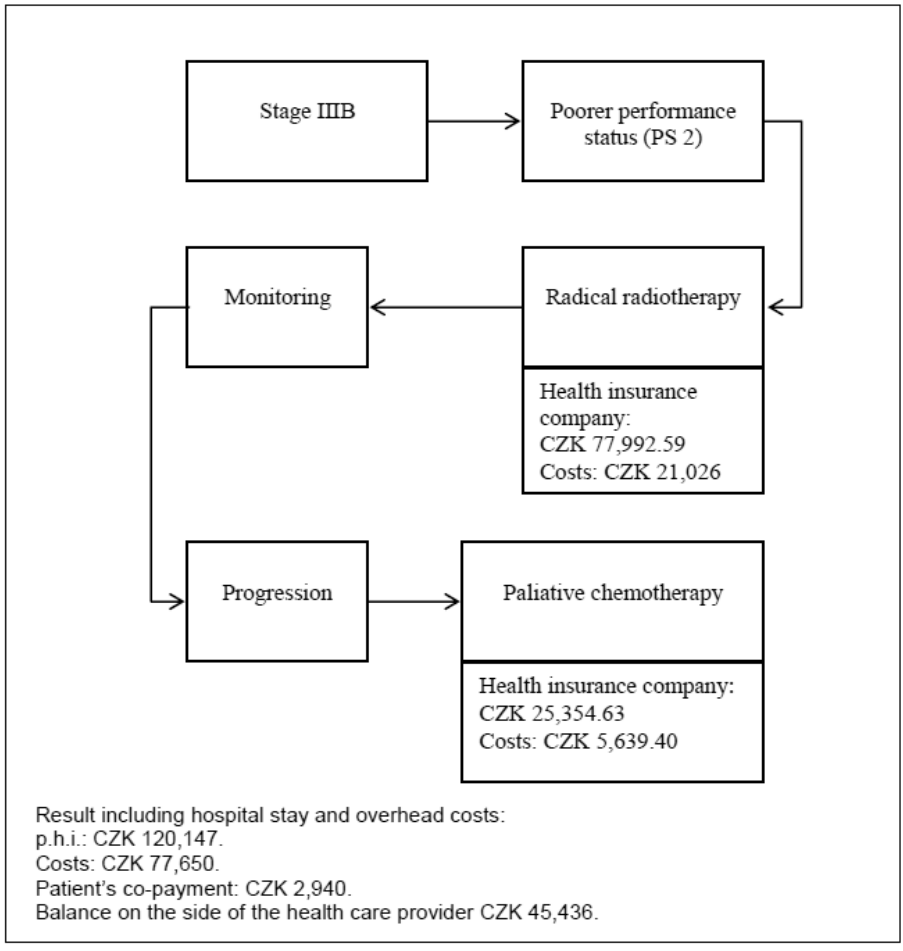
Source: Authors' design based on recommended therapeutic procedures [5], [20], [21], [30]

2. Results

The results presented in this study are calculated based on some diagnostic and therapeutic algorithms, i.e. process maps. These, in turn, were designed, based on recommended therapeutic procedures issued by the Masaryk Institute of Oncology, the University Hospital in Hradec Králové and the University Hospital in Plzeň [5], [20], [21], [30]. Based on these issued therapeutic standards, these maps were modified into their current form. Procedures are subdivided according to the above mentioned basic types of the disease into small-cell lung cancer (SCLC) and non-small-cell lung cancer (NSCLC). Each procedure consists of diagnostics, therapy and the subsequent monitoring of patients. The costs for such respective steps were assessed in individual blocks, and the total costs for the particular therapeutic scheme were subsequently calculated.

As an example, the therapeutic algorithm for stage IIIB of NSCLC (Fig. 1–3) is demonstrated. An entire set of process maps

Fig. 3: Non-small-cell type of lung cancer – second therapeutic path for stage IIIB



Source: Authors' design based on recommended therapeutic procedures [5], [20], [21], [30]

may be found in [26]. All calculations are always based on the basic algorithm which is successively subdivided into such individual diagnostic or therapeutic paths. These paths allowed us to calculate the costs for individual therapeutic alternatives which a patient may undergo. The term path is used in this context to describe the therapeutic process undergone by an individual patient based on a clinician's recommendations involving standard therapeutic procedures. Hence, a path describes one of the alternatives that a patient may undergo.

Algorithms in Figs. 1–3 are compiled according to the above mentioned data capturing the recommended diagnostic and therapeutic procedures for stage IIIB of NSCLC. The calculation of all the other recommended alternatives (depending on the type and stage of the disease) followed the same principle.

Using the procedure above, the costs for 32 utilized procedures (process maps) were calculated. The costs for therapeutic processes account for 22 results, while diagnostic procedures account for 10 results. Both direct

and indirect costs were included in some individual calculations. The overview of costs for all 32 processes is presented in Tabs. 1 and 2, whereby costs on the part of the health care provider, health insurance payments (= the payer's costs), patient's co-payments, and the balance in the provider's favour are included. The patient's co-payment (regulatory fee) depends on the average time of treatment in relation to which the numbers of regular medical check-ups and the presumed length of hospital stays are determined.

Tab. 1: Non-small-cell type of lung cancer: complete results (all data are in CZK)

Type of procedure	Costs	Payment from instance	Co-payment	Balance
Dg. Path 1	32,926	33,726	0	800
Dg. Path 2	25,766	25,539	0	-226
Dg. Path 3	19,336	21,684	0	2,348
Dg. Path 4	26,496	29,871	0	3,375
Therapy IA Path 1	120,950	155,256	2,940	31,366
Therapy IA Path 2	77,673	108,602	5,290	25,639
Therapy IA Path 3	138,110	169,065	5,290	25,666
Therapy IB-IIIA Path 1	120,950	155,255	2,940	31,365
Therapy IB-IIIA Path 2	103,691	91,073	5,290	-17,907
Therapy IB-IIIA Path 3	132,493	169,065	5,290	31,282
Therapy IB-IIIA Path 4	132,493	169,066	5,290	31,283
Therapy IIIB Path 1	100,401	96,459	2,940	-6,882
Therapy IIIB Path 2	71,770	120,147	2,940	45,437
Therapy IV Path 1	69,487	94,792	2,700	22,605
Therapy IV Path 2	519,810	579,040	2,700	56,530
Therapy IV Path 3	582,050	608,075	2,700	23,325
Monitoring for T1 N0	82,723	86,028	0	3,305
Monitoring – inoperable dinase	69,704	78,256	0	8,523
Monitoring of metastases	55,354	63,872	0	8,518

Source: Authors' calculation based on the procedure described in the sections Methodology and Results.

Remark: TNM – international classification of the disease extent
T1 N0 – disease in the least possible stage

The DRG system sets "average" reimbursements for all procedures (diagnostic and therapeutic) connected with the given diagnosis (weighted average depending on the number of patients in individual alternatives). By its very nature, therefore, the health insurance company does not consider different alternative therapies, but acknowledges on behalf of the hospital a "standardised" reimbursement for any type of treatment for the given diagnosis. The system according to the authors was that deviations from the average would be mutually compensated, and this system would simplify all reporting. It is not the purpose of this article to describe the actual handling of the DRG system in the whole system within the Czech health care system, nor in individual hospitals. In general we do not mind that the reimbursement of the care is underestimated. In terms of the diagnostics and treatment of bronchogenic carcinoma, only 6 diagnostic groups come into account presented in Tab. 3 (CC standing for complications and commorbidities).

Tab. 2: Small-cell type of lung cancer: complete results (all data are in CZK)

Type of procedure	Costs	Payment from insurance	Co-payment	Balance
Dg. Path 1	16,324	16,681	0	357
Dg. Path 2	22,754	20,778	0	-19,758
Dg. Path 3	33,754	32,147	0	-1,606
Dg. Path 4	27,324	26,091	0	-1,233
Therapy for an extensive disease Path 1	102,685	107,985	2,255	3,046
Therapy for an extensive disease Path 2	73,008	51,120	2,255	-24,143
Therapy for an extensive disease Path 3	80,658	109,555	2,255	26,642
Therapy for a limited disease Path 1	130,096	177,954	2,549	45,309
Therapy for a limited disease Path 2	138,657	239,738	2,549	98,532
Therapy for a limited disease Path 3	90,246	104,635	2,549	11,840
Therapy for a limited disease Path 4	122,308	183,580	2,549	58,722
Monitoring of a limited disease	21,375	23,200	0	1,825
Monitoring of an extensive disease	2,553	2,733	0	180

Source: Authors' calculation based on the procedure described in the sections Methodology and Results.

Reimbursements are calculated applying the following formula:

$$DRG\ reimbursement = cost\ weight \times (basic\ rate + additional\ factors) \quad (1)$$

Tab. 3: Reimbursements using the DRG system

Group	Reimbursement amount
Radiotherapy without CC	1.2552 × (37,279+1,497) = CZK 48,672
Chemotherapy without CC	0.6824 × (20,269+10,917) = CZK 21,281
Major chest surgery without CC	3.1129 × (92,453+12,812) = CZK 327,679
Minor chest surgery without CC	2.5833 × (76,725+15,220) = CZK 237,522
Malign diseases of respiratory system without CC	0.6493 × (19,285+1,752) = CZK 13,659
Syndromes, symptoms and other diagnoses of the respiratory system without CC	0.4140 × (12,296+222) = CZK 5,182

Source: NRC and authors' calculation

3. Discussion

The study presents some cost calculations for individual diagnostic and therapeutic procedures at different stages of bronchogenic carcinoma. The calculations of disease related costs are always based on one standard treatment algorithm that is recommended and typical of the particular patient's performance status. Genuine patients with lung cancer, however, continuously fight the disease and, therefore, they participate in several of these therapeutic schemes. The treatment in practice may differ from recommended standards as the clinician must react to the patient's current status at any given moment. Moreover, there are other symptoms that usually also interfere in the course of such severe diseases, and it is very difficult to distinguish whether they have been caused by the tumour or are independent of it. This, however, does not affect the calculation of the cost rates for the individual stages in the therapeutic process.

In the case of SCLC and NSCLC diagnostic procedures, the assumption that the health

care provider covers their costs may be confirmed with a high level of reliability. Diagnostic methods may be divided into imaging, laboratory and surgical methods. The reimbursements for imaging and surgical diagnostics cover actual costs of the health care providers. With respect to laboratory methods, this is not necessarily the case. Based on our own calculations, we estimate that the reimbursement represents a mere 61% of the incurred costs. The costs for laboratory methods are not essential for the health care providers as they account for a relatively small portion of the total costs that mainly include the costs for therapies.

A more detailed analysis of costs relating to non-small-cell lung cancer revealed that the health care provider's financial balance is predominantly positive. These are usually amounts with a maximum positive balance of CZK 56,530. However, the total costs on the part of hospitals, as well as payers are higher. The increase in costs is mainly caused by the prescribing of biological drugs. If this therapeutic procedure is not applied, the costs on the part of the health care provider, reach the maximum amount of CZK 143,399.60. It must also be mentioned that the time of treatment was calculated based on published studies where the average survival time was 7.8 months. In reality, however, the health insurance company reimburses targeted drugs only after the progression of the disease may be manifested e.g. not earlier than after 20 months, which further significantly increases the actual costs. This also increases the reimbursements on the part of the health insurance company and, therefore, also the positive balance on the part of the health care provider.

With respect to the calculation of the small-cell lung cancer therapy, the provider again reaches a positive balance. The most significant financial benefit for the provider is in the case of a so-called limited disease (one of the forms of SCLC where radiotherapy plays an indispensable role). Radiotherapy significantly affects the resulting costs. In the calculation of the X-ray scheme for SCLC, for example, the health insurance company reimburses CZK 75,595, while the actual estimated costs amount to CZK 18,107. This difference allows the health care provider to compensate for the methods that may result in a negative balance owing to reimbursements. The situation is solved by the DRG system that corresponds more to the actual costs. The amounts of DRG reimbursements are presented in Tab. 3.

The patient's co-payments represent above all, the so-called regulatory fees. These are incomes for health care facilities. If they exceed the limit set for a year (CZK 5,000, or CZK 2,500 for certain groups of patients in 2013), they are reimbursed to patients. This, however, does not affect the balance of the health care facilities.

Conclusions

The calculations above imply that treatment costs significantly differ depending on the selected diagnostic and therapeutic procedures. It also becomes apparent that the setting of the reimbursement system presently generates different stimuli for providers who may reach both positive and negative balances. This fact, in turn, may have an effect on the economic result leading as a consequence thereof, to the preference of alternatives more suitable in terms of reimbursement regardless of the optimum procedures for the particular patient. This fact is, to some extent, reflected by reimbursements calculated by means of the DRG system. The existing legal regulations and relations between individual actors create a situation, whereby it is complicated to obtain full information for the calculation of costs. Therefore, the costs on the part of the provider presented here are expert estimates based partly on publicly available sources and partly on expert opinions, which is a limiting factor with respect to the above calculations. We are of the opinion that the resulting costs modelled and presented in this study may truly reflect the situation in Czech hospitals (see also [24]). In the same way, we may assume that there are differences among health care providers both with respect to the specific costs and to those declared to assess such working costs that will give rise to accurate calculations for a particular hospital and a respective type of care in general.

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References

[1] BANZ, K., BISCHOFF, H. et al. Comparison of treatment costs of grade 3/4 adverse events associated with erlotinib or pemetrexed maintenance therapy for patients with advanced non-small-cell lung cancer (NSCLC) in Germany, France, Italy, and Spain. *Lung Cancer.* 2011, Vol. 74, No. 3, pp. 529-534. ISSN 0169-5002.

[2] *Bodník* [online]. Dan Ohnesorg, 2011 [cit. 2013-02-20]. Available from: http://www.bodnik.cz.

[3] CHANG, S., LONG, S.R., et al. Estimating the Cost of Cancer: Results on the Basis of Claims Data Analyses for Cancer Patients Diagnosed With Seven Types of Cancer During 1999 to 2000. *Journal of Clinical Oncology.* 2004, Vol. 22, No. 17, pp. 3524-3530. ISSN 0732-183X.

[4] CHOUAID, C., ATSOU, K., et al. Economics of Treatments for Non-Small Cell Lung Cancer. *Pharmacoeconomics*. 2009, Vol. 27, No. 2, pp. 113-125. ISSN 1170-7690.

[5] ČOUPKOVÁ, H. *Nemalobuněčný bronchogenní karcinom* [online]. Brno: Masaryk Memorial Cancer Institute, 2011 [cit. 2013-02-20]. 11 p. (PDF). Available from: http://www.mou.cz/2-1-nemalobunecny-bronchogenni-karcinom/f76.

[6] CIPRIANO, L.E., ROMANUS, D., EARLE, C.C., et al. Lung cancer treatment costs, including patient responsibility, by disease stage and treatment modality, 1992 to 2003. *Value in Health.* 2011, Vol. 14, No. 1, pp. 41-52. ISSN 1098-3015.

[7] CZECH NATIONAL BANK. *Central bank exchange rate fixing*, 2013 [online]. Praha: ČNB, 2013 [cit. 2013-02-20]. Available from: http://www.cnb.cz/en/.

[8] CZECH REPUBLIC. Decree No. 475/2012 Coll., which fixes the value of a point, reimbursement limits for covered services, and regulation limits for 2013. *Sbírka zákonů. Česká republika* 2012, No. 178, pp. 6258-6338. ISSN 1211-1244.

[9] DEDES, K.J., SZUCS, T.D., et al. Management and costs of treating lung cancer patients in a university hospital. *Pharmacoeconomics*. 2004, Vol. 22, No. 7, pp. 435-444. ISSN 1170-7690.

[10] DEMOS EUROPA. Towards a sustainable and outcome-driven healthcare: effective healthcare systems at a time of fiscal austerity [online]. V4 Multi-stakeholder Dialogue Warsaw Meeting, Session report, 13-14 December 2011 [cit. 2013-12-15]. Available from: http://www.demoseuropa.eu/index.php?option=com_content&view=article&id=1007:towards-a-sustainable-and-outcome-driven-healthcare&catid=130:2011events&Itemid=155&lang=en.

[11] FERNANDEZ, R.L., et al. Economic burden of cancer Gross the European Union: a population based cost analysis. *The Lancet Oncology.* 2013, Vol. 14, Iss. 12, pp. 1164-1174. ISSN 1470-2045.

[12] DOLEŽAL, T., PÍSAŘÍKOVÁ, Z., ZEMANOVÁ, P., BARTÁŠKOVÁ, D. Costs of Type II Diabetes in the Conditions of the Czech Republic's Medical Care System. *Vnitrni Lek.* 2009, Vol. 55, pp. 342-344. ISSN 0042-773X.

[13] HESERAU, D., et al. Consolidated Health Economic Evaluation Reporting Standards (CHEERS) Statement. *Value in Health.* 2013, Vol. 16, pp. e1-e5. ISSN 1098-3075.

[14] JOSHI, A.D., CARTER, J.A., et al. Cost-effectiveness of zoledronic acid in the management of skeletal metastases in patients with lung cancer in France, Germany, Portugal, the Netherlands, and the United Kingdom. *Clinical Therapeutics.* 2011, Vol. 33, No. 3, pp. 291-304.e8. ISSN 0149-2918.

[15] KUTÍKOVÁ, L., BOWMAN, L., et al. The economic burden of lung cancer and the associated costs of treatment failure in the United States. *Lung Cancer.* 2005, Vol. 50, No. 2, pp. 143-154. ISSN 0169-5002.

[16] MAŠKOVÁ, E. *Wages and salaries in health services in 2011* [online]. Praha: ÚZIS, Aktuální informace, 2012. Vol. 30 [cit. 2013-02-20]. Available from: http://www.uzis.cz/rychle-informace/mzdy-platy-ve-zdravotnictvi-roce-2011.

[17] MOLINIER, L., COMBESCURE, C., et al. Cost of lung cancer – A methodological review. *Pharmacoeconomics*. 2006, Vol. 24, No. 7, pp. 651-659. ISSN 1170-7690.

[18] NRC [online]. Praha: Národní referenční centrum, 2003 [cit. 2013-04-30]. Available from: http://www.nrc.cz/.

[19] OECD. *Cancer Care: Assuring Quality to Improve Survival.* Paris: OECD, 2013. 163 p. ISBN 978-92-64-180963.

[20] PETERA, J. *Guidelines for treatment of non-small-cell lung cancer: Standard treatment procedure version 2013* [online]. Hradec Králové: Clinic of Oncology and Radiotherapy, University Hospital Hradec Králové, 2013 [cit. 2013-04-30]. 10 p. (PDF). Available from: www.fnhk.cz/fs880/nemalobunecny-karcinom-plic.pdf.

[21] PETERA, J. *Guidelines for treatment of small-cell lung cancer: Standard treatment procedure version 2013* [online]. Hradec Králové: Clinic of

Oncology and Radiotherapy, University Hospital Hradec Králové, 2013 [cit. 2013-04-30]. 4 p. (PDF). Available from: www.fnhk.cz/fs879/malobunecny-karcinom-plic.pdf.
[22] PHUNMANEE, A., WIRASORN, K., et al. Lung cancer in hospitalized patients of Thailand. *Journal of the Medical Association of Thailand.* 2012, Vol. 95, Iss. 7, pp. S201-S205. ISSN 0125-2208.
[23] POMPEN, M., GOK, M., et al. Direct costs associated with the disease management of patients with unresectable advanced non-small-cell lung cancer in The Netherlands. *Lung Cancer.* 2009, Vol. 64, No. 1, pp. 110-116. ISSN 0169-5002.
[24] ROGALEWICZ, V., ŠIMROVÁ, J., et al. The Analysis of Costs and Reimbursements for Lung Cancer Treatment in the Czech Republic. *Value in Health.* 2013, Vol. 16, No. 7. pp. A407. ISSN 1098-3015.
[25] SCHILLER, J., TILDEN, D., et al. Retrospective cost analysis of gemcitabine in combination with cisplatin in non-small cell lung cancer compared to other combination therapies in Europe. *Lung Cancer.* 2004, Vol. 43, No. 1, pp. 101-112. ISSN 0169-5002.
[26] ŠIMROVÁ, J. *Economic analysis of lung cancer therapy.* Master Thesis. Kladno: Fakulta biomedicínského inženýrství ČVUT v Praze, 2013. 120 p.
[27] STANISIC, S., BISCHOFF, H.G., et al. Societal cost savings through bevacizumab-based treatment in non-small cell lung cancer (NSCLC). *Lung Cancer.* 2010, Vol. 69, No. Suppl. 1, pp. S24-S30. ISSN 0169-5002.
[28] ÚZIS ČR, NOR ČR. Cancer Incidence 2010 in the Czech Republic [online]. Praha: ÚZIS, 2013 [cit. 2013-06-10]. Available from: http://www.uzis.cz/en/publications/cancer-incidence-2010. ISBN 978-80-7472-034-5.
[29] VERGNENÈGRE, A., MOLINIER, L., et al. The Cost of Lung Cancer Management in France from the Payor's Perspective. *Disease Management & Health Outcomes.* 2006, Vol. 14, No. 1, pp. 55-67. ISSN 1173-8790.
[30] VOJTÍŠEK, R., FÍNEK, J. Current recommendations for planning radiotherapy for non-small cell lung cancer. *Studia Pneumologica et Phthiseologica.* 2012, Vol. 72, No. 3, pp. 151-158. ISSN 1213-810X.
[31] VOJTÍŠEK, R., HAVRÁNEK, K., FÍNEK, J. The Use of PET/CT Fusion in Radiotherapy Treatment Planning of Non-Small-Cell Lung Cancers. *Klinická Onkologie.* 2011, Vol. 24, No. 1, pp. 23-34. ISSN 0862-495X.
[32] WHO. *Cancer. Fact Sheet No. 297* [online]. Copenhagen: WHO, 2013 [cit. 2013-06-06]. Available from: http://www.who.int/mediacentre/factsheets/fs297/en/.
[33] WOLSTENHOLME, J.L., WHYNES, D.K. The hospital costs of treating lung cancer in the United Kingdom. *British Journal of Cancer.* 1999, Vol. 80, No. 1-2, pp. 215-218. ISSN 0007-0920.
[34] ZENG, X, et al. The Cost of Treating Advanced Non-Small Cell Lung Cancer: Estimates from the Chinese Experience. *PLOS ONE* [online]. 2012, Vol. 7, Iss. 10 [cit. 2013-01-11]. Available from: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0048323. ISSN 1932-6203.

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Abstract

THE COSTS AND REIMBURSEMENTS FOR LUNG CANCER TREATMENT AMONG SELECTED HEALTH CARE PROVIDERS IN THE CZECH REPUBLIC

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The objective of the article is to objectivise and assess the costs for the lung cancer therapy from the payer's (health insurance company) and the healthcare provider's (hospital) perspective based on information available from several large hospitals and specialised centres. No comprehensive assessment of costs related to the treatment of lung cancers at all stages has been published in the Czech Republic to-date. The results in this study are calculated based on diagnostic and therapeutic algorithms, i.e. process maps. These, in turn, are derived from the recommended therapeutic procedures issued by the Masaryk Institute of Oncology, the University Hospital in Hradec Králové and the University Hospital in Plzeň. In total, the costs and reimbursements were calculated for 32 utilized algorithms, i.e. process maps. The costs for therapeutic processes account for 22 results, while 10 results correspond to diagnostic processes. Both direct and indirect costs were included in individual calculations. The calculations imply that treatment costs significantly differ depending on the selected diagnostic and therapeutic procedure. It becomes apparent that the setting of the reimbursement system presently generates different stimuli for providers, who may reach both positive and negative balances. This fact, in turn, may have an effect on the economic result leading, in its consequence, to the preference of more suitable alternatives in terms of reimbursement regardless of the optimum procedures for the particular patient. This fact is, to a certain extent, reflected by the reimbursements calculated by means of the DRG system. The given algorithms may potentially be used by health care providers to reach working costs, which will allow accurate calculations for particular hospitals.

Key Words: *Lung cancer, healthcare costs, process maps, health care reimbursement.*

JEL Classification: *I12.*

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THE COMPETITIVE ENVIRONMENT AMONG COMPANIES IN THE CZECH PART OF EUROREGION NEISSE-NISA-NYSA

Jaroslava Dědková, Klára Blažková

Introduction

The competitive environment in the global economy of the 21st century is highly-complex, demanding and full of competitive opportunities and threats. An effective strategy of company management can help companies improve their performance when faced with simultaneous competition in a turbulent and unpredictable environment. Each and every entrepreneur must be aware that his customers and his own business are not alone on the market – he must know his competition. [5]

The Czech economy has also undergone considerable change in the past two decades. The period of transformation from planned economy to market economy and the opening-up of the Czech economy are linked to the arrival of new competitors from abroad and even fiercer competition. This has also resulted in a change to the competitive advantage and competitiveness of Czech companies. [18]

When **planning business activity,** all companies need to be able to forecast future development on the market on which they wish to operate. Knowledge of the environment in which a company operates and information about the competition are the currency of each and every business. Being aware and having an overview of competing companies, their products and prices are essential to preparing sales tactics and putting together a company strategy from the perspective of offering and presenting a company's own products. As with the environment in which the company is active, the competitive environment continues to develop, meaning that continual attention must be paid.

The main aim of the paper is to analyse the strength of the competitive environment, the primary competitive advantages of the companies within ERN and the dependence of the competitive strategies chosen and competitive advantage among the companies active within the Czech part of ERN.

A quantitative form of collecting data, by way of written questionnaire, was chosen as the method of obtaining the information we required, this questionnaire taking the shape of an electronic survey created using the tools available at Google.com. The survey was carried out in January and February 2013 in the Czech part of ERN and was anonymous. The Statgraphics programme was used to process data.

1. The Terms "Competitive Advantage" and "Competitiveness"

Defining "competitive advantage" and "competitiveness" can be done from both the macroeconomic and the microeconomic reading of the terms. Nevertheless, both perspectives are connected to each other and it can be said that a company's competitive advantage (microeconomics) influences and predetermines the competitiveness of the whole, meaning the macroeconomic point of view [1]. This is indicated in the microeconomic nature of the term "competitiveness", which defines a competing company as a company that is able to compete with the competition [1] and encapsulates the relative performance of the company in question at the given time. This general concept can be developed and competitiveness defined as a characteristic which allows a business undertaking to be successful when it competes with other business undertakings [5]. Competitive advantage and competitiveness are closely

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related to each other and are in fact relative terms [19]. Any identification of competitive advantage draws on a comparison of a group of companies, in that this comparison is itself dependent on the nature of the market environment in which the company operates.

We cannot talk of a company's competitive advantages without also talking of specific competitive conditions or independent of a specification of rivals. A company might be competitive in relation to several rivals, but uncompetitive to others. [7]

Competitiveness is fundamentally generated through competitive advantages, for which we can accept Porter's concept that as such they offer the company an advantage over its competitors. Competitive advantage can be seen here as a factor that helps or allows a company to achieve success, although it need not guarantee it [11]. There are many levels to the idea of competitive advantage and the competitiveness that arises from it in terms of the concept of a company's success.

The first level is achieving sufficient quality of advantages and competitiveness for the company to be able to compete in the first place. We can understand this achievement of basic limits to be the qualifying level of competitiveness. The next level, "self-realisation", helps the company achieve such success by reaching set targets that do not fundamentally threaten other competitors. In practice, this means that the company pursues its own specific targets, the achievement of which does not restrict competitors in reaching their targets. In this case, companies do not come into direct conflict. The third level is required when it is impossible for a company to accomplish its own targets without affecting the achievement of targets by its competitors in some significant way. [22]

Creating a competitive advantage on the market means achieving two things:

1. **Creating something the competitors do not have;**
2. **Creating something that customers consider to be better than the alternatives** (perhaps the products made by direct competitors, something they can make on their own or doing nothing).

Therefore, creating **a high and unique value** in the eyes of the customers means having a competitive advantage.

A competitive advantage is something extra that a company offers over the competition. Something that makes the company exceptional. It is not easy being the best in your field in this day and age; after all, everyone else is trying to do the same. It is now about details, which the customer uses to decide who to choose and where to buy. Everyone tries to offer the best-quality products they can at the most reasonable prices.It needs to be able to provide every potential customer with an answer to the question, "Why should I buy from them?" Among other, our project was interested in whether companies are aware of their competitive advantage and how they are dependent on the competitive strategy they chose.

Pace offers a different view of competitiveness: one of the primary goals of organizations in a free enterprise systém. Although the measures of competitiveness may appear different for manufacturing and service organizations or for government and religious organizations, in order to be competitive, any organization must provide products and services for which customers or clients are willing to pay a fair return or price. In the long run, in a free enterprise system, competitiveness is measured by the ability of the organization to stay in business and to protect the organization's investments, to earn a return on those investments, and to ensure jobs for the future. [9]

We assume that a competitive advantage is a sort of image in the eyes of customers, employees, suppliers etc. (so-called stakeholders) and is a prerequisite for the economic management of a company. It also stands that if the company is able to compete, it is also highly efficient. In the short-term, we are interested mainly in profitability or market share and in the long-term in the capacity to innovate and grow, company strategy, vision for the future or the use of company potential. [17], [18]

1.1 Types of Competitive Advantage

It is universally known that quality, supply (reliability), flexibility and effectiveness of costs are possible competitive advantages. Quality can be defined, through a set of innate properties, as the level of requirement of satisfaction. The quality of a product encompasses the technical

perspective (production technology and technical standards) and (in particular) the ability to satisfy customer requirements [18]. Customer satisfaction is closely related to other factors, such as loyalty or the value for the customer, which significantly increase the competitive advantage and competitiveness of the company [15]. Many managers believe that all functions of the company need to be improved at the same time in order to improve some of the constituent parts of that company's competitive advantage. [21]

Recent studies, however, affirmatively showed the importance of non-price factors as basic determinants of competitiveness. The scope of non-price factors is diverse. It includes:

- human resources and personnel conditions, such as employee skills and motivation;
- technical factors such as research and development capabilities and the ability to adapt and use technology;
- management and organisational factors, both internal, in relation to the company, and external relations with other bodies (customers, suppliers, public and private research institutes and other companies).

These factors determine the ability of a company to achieve and maintain a profitable position in a changing environment.

According to Porter, there are four mutually-dependent and mutually-reinforcing attributes of competitive advantage that allow companies to successfully compete in a particular field:

- the availability of qualified labour and infrastructure;
- demand for goods and services on the market;
- associated support of industry, including the presence of competing suppliers;
- company strategy, structure and rivalry. [13]

Porter describes these factors as those which "individually, and as a system, create the context in which a nation's firms are born and compete". Porter considers that the most important issue of all for competitiveness lies in the pressure that these factors exert on firms to invest and innovate. [2]

Continually improving the range of products or services that a company can offer has become increasingly popular. Continual improvement is based on five pillars:

- the involvement of all company employees at all levels;
- looking for savings without making investment;
- enumerating data and information;
- using common sense as a basic tool;
- implementing ideas from practice. [14]

An increasing number of companies no longer focus on competition and employing the competitive advantage of price, instead concentrating on quality, service and individualising the range of goods or services they offer. To assert themselves on the market, however, companies are also using a competitive strategy based on their experience or specific know-how and the expertise of their workers. Some companies build their success on the reputation of the company or a brand of products. [4] Some companies consider their management of key customers to be a competitive advantage.[11] Companies can achieve considerable competitive advantage by taking into consideration the ethical and environment demands placed on products, price and distribution. Cementing the company's position within the competitive environment, having satisfied customers and achieving better financial results: these are just some of the advantages arising from greater responsibility in a company's marketing behaviour [8], [10].

1.2 Euroregion Nisa

More emphasis has been placed on the significance of the region in recent years. This goes hand-in-hand with the recognition that regions are the foundation of national competitiveness; it is at this level that we see the direct clash of those who create knowledge and those who use it. The prosperity of a region, then, depends primarily on how that particular region succeeds in overcoming the potential gulf between these two groups of entities [1].

The second reason for such emphasis having recently been placed on regions is the change in the world economy, which is becoming "regionalised" as multinational groupings. This leads to a certain restriction in the role of nation states, which lose certain opportunities in terms of carrying out macroeconomic policy. It can be said that states have become regions in a way, since their procedures in influencing economic phenomena are more reminiscent of the procedures used by regional authorities.

Euroregion Neisse – Nisa – Nysa

Euroregion has been established in 1991. All three parts of the region are united by many common issues and interests arising from similar system transformations and many years of common history. The River Nisa which forms the border between Germany and Poland is unifying element of the area as a whole and the traditional symbol of mutual cooperation.

The Czech part of Euroregion Nisa encompasses Česká Lípa, Jablonec nad Nisou, Liberec, Semily and the northern part of the Děčín district (around Šluknov) and covers around 4.5% of the area of the Czech Republic. This part of the Euroregion is home to 135 municipalities (figure taken from 2011). Emphasis is placed on strengthening competitiveness and regional economic bases by way of cooperation, with special consideration for interaction between small and medium-sized businesses and in support of developing new business opportunities. [3]

Tab. 1: Selected indicators for the region

		Liberec	Jablonec nad Nisou	Česká Lípa	Semily	Total
Number of undertakings		52,239	24,391	23,847	19,431	119,908
By number of employees	0–9	51,363	23,989	23,484	19,060	
	10–49	680	318	278	283	
	50 and over	196	84	80	88	
By economic activity	agriculture	1,649	647	1,031	1,264	
	industry	15,468	7,950	6,805	5,484	
	services	34,194	15,052	15,126	12,116	
Rate of unemployment		9.9%	9.3%	11.9%	10.0%	10.3%
Population		171,007	89,987	103,037	74,563	438,594
GDP		CZK 283,671 per one head of population		CZK 124,416 million Total = 3.2 % of the figure for the Czech Republic		
Average gross monthly pay		CZK 22,823				

Source: [3]

The main industries here are the traditional glass and costume jewellery, the manufacture and processing of plastics, engineering and branches of the processing industry closely linked to car manufacturing. The textile industry has experienced a slump in recent years and has lost its once-prominent position. In terms of the rate of unemployment, the Liberec region is one of the worst-affected areas, having a rate of 10.3% at 31. 12. 2012.

The economy of the Liberec region is strongly represented by the processing industry. This relates to the long-standing industrial traditions of the region and major recent investment by foreign companies. The share of the processing industry in the creation of gross added value is around 50% higher than the average for the Czech Republic. The share of construction is also slightly higher, but other significant branches have a lower share in the Liberec region in comparison with the Czech Republic. Somewhat surprising is the higher share of education and the health industry. **Small and medium-sized businesses** have an important position in the regional economy, **employing 65.5% of the total number of employees** in 2012. [6]

The area is characterised by a long-standing tradition of technical know-how and other specific export production, by the existence of a relatively-well qualified workforce in certain industries (particularly engineering and glass-making) and its competitiveness from the perspective of salary costs and by the development of business activity by foreign investors, primarily in the motor industry and other export industries.

Systematic support of small and medium-sized business presents an opportunity for this area, as do using the transfer of innovation to increase the competitiveness of all business undertakings, the preparation and development of business zones and technology parks, the development of strategic services and of progressive branches with high added value in cooperation with foreign organisations and companies and the involvement of regional science and research centres and the potential of the Technical University of Liberec. [6]

2. Results and Analyses

This section examines and evaluates the quantitative data taken from a questionnaire survey. It is divided into smaller parts, the first characterising the profile of respondents and the second concentrating on a statistical analysis of selected questions relating to the competitive environment. A total of 170 companies from the Czech part of Euroregion Nisa completed the questionnaire.

2.1 Methodological Procedure of Marketing Survey

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

A uniform, standardised, structured questionnaire was used to gather data in which the wording and order of questions were precisely set out. Closed-ended, multiple-choice questions were mainly used in the questionnaire, although open-ended questions were employed to ascertain competitive strategies. The Statgraphics programme was used to process data.

Closed-ended, multiple-choice questions were mainly used when putting together the questionnaire. A set of variables that influence the competitiveness of a company was assembled based on the theoretical knowledge available and space was given to respondents to rate these individual variables.

2.2 Characteristics of the Sample

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

The opening questions 1 to 5 in the questionnaire were designed to identify the sample of respondents. The first question was used to identify the location of the company within Euroregion Nisa. This spread of companies corresponds to the size of the districts in question.

Core business activities differed greatly and were divided into the categories of industry, services, trade and transport and other to help us process the information. Eighty-nine companies were classified under industry (building, engineering, glassmaking, food production, textile industry), meaning 52%, 77 were classified under services, trade and transport (45%) and the rest, almost 3%, were deemed to be part of another specific industry.

2.3 Intensity of Competition and Number of Competitors

A statistical evaluation of the answers we received allows us to better identify the competitive environment and company activity relating to the growing competition within Euroregion Nisa.

As part of the questionnaire survey, companies considered their competitive environment by looking at the intensity of competition and the number of competitors they have. Statistical processing allowed us to look at the possibility of whether there is a relationship between the intensity of competition and the number of competitors. We set out hypothesis 0, which proves that there is no relationship between the intensity of competition and the number of competitors, and hypothesis 1, which confirms dependence, and tested these.

H_0: There is no relationship between the intensity of competition and the number of competitors.

H_1: There is a relationship between the intensity of competition and the number of competitors.

Given that this is a categorised variable, a contingency table 1 was chosen for evaluation purposes.

Tab. 2: Characteristics of the sample

	Liberec	Jablonec nad Nisou	Česká Lípa	Semily		
Location of company	53%	14%	13%	20%		
Legal form of business undertaking	joint stock company 29%	limited liability company 61%	state enterprise 4%	cooperative 1%	natural person 5%	
Number of employees	Less than 10 14%	11–20 11%	21–50 11%	51–100 24%	101–200 14%	More than 200 27%
Business activity	Industry 52%	Services 45%	Other 3%			
Foreign capital	Up to 25% 2.4%	26–50% 5.3%	51–75% 6.5%	Over 75% 16%	No foreign capital 69.8%	

Source: compiled by the authors

Tab. 3: Contingency table of dependence of intensity of competition on number of competitors

	Strong	Weak	Medium	Row total
0 competitors	0	6	0	6
	0.00%	3.53%	0.00%	3.53%
1 competitor	0	4	4	8
	0.00%	2.35%	2.35%	4.71%
2–5 competitors	13	2	50	65
	7.65%	1.18%	29.41%	38.24%
5 or more competitors	75	0	16	91
	44.12%	0.00%	9.41%	53.53%
Column total	88	12	70	170
	51.76%	7.06%	41.18%	100.00%

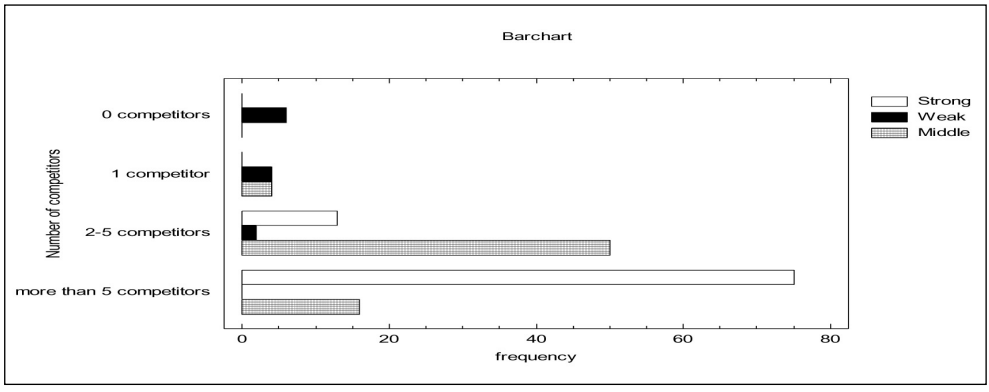
Source: compiled by the authors

We can say that the H_0 hypothesis, at a significance level of 5%, can be rejected. The indicators of the descriptive statistic allow us to say that the intensity of competition is dependent on the number of competitors. The intensity of dependence is substantiated by the value of the contingency coefficient – 0.7109, representing medium dependence. Pearson's moment correlation coefficient reaches a value of 0.58 (p-value < 0.01).

2.4 Improving Competitive Position on the Market

Another question focusing on the issue of the competitiveness of companies is to identify whether they involve themselves in trying to move ahead of the competition, either through their own activities or with the help of a consultant.

Fig. 1: The intensity of competition



Source: own

Tab. 4: Engaging the competition – the company itself

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency
1	yes	93	0.5471	93	0.5471
2	no	16	0.0941	109	0.6412
3	sometimes	24	0.1412	133	0.7824
4	probably	37	0.2176	170	1.0000

Source: own

It is evident from the table 4 above that 93 of the 170 companies systematically engage in trying to move ahead of the competition. The largest sector is the engineering industry, with 20.43%, followed by services – other and services – commerce with 13.97% each. By contrast, only 16 companies do not engage in this issue themselves.

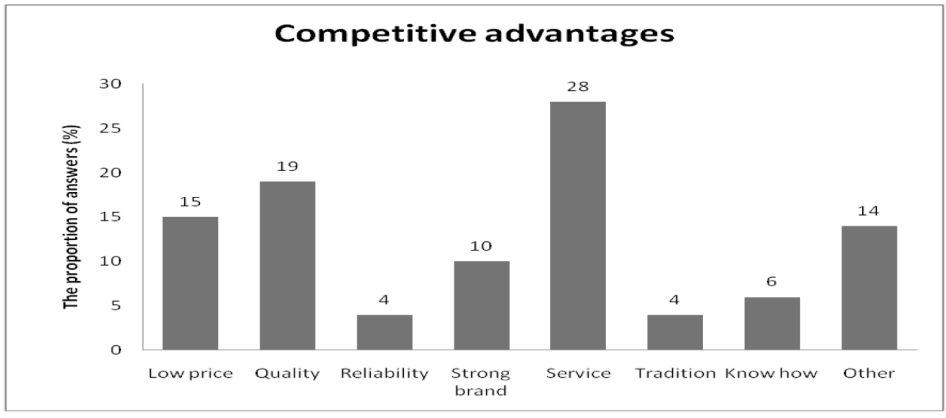
2.5 The Competitive Advantage of a Company

According to Michael E. Porter [12], competitive advantage is at the heart of the efficiency of a business entity on a market with established competition. It stems from the value which the entity is able to offer its customers and which exceeds the costs of its creation.

The question figured in the questionnaire survey as an open-ended question and companies therefore had the opportunity to express in full the elements behind their competitive advantage. Given that open-ended questions are harder to evaluate from the statistical perspective, answers had to be coded and assigned to the following categories: low price, quality, reliability, strong brand, service, tradition, know-how and other.

Companies most often see their competitive advantage as being the service they provide. Twenty-eight per cent of respondents, in fact, replied as such (Fig. 2). The second most commonly-used competitive advantage was the quality of the company's products or services and in third place low price. By contrast, least companies consider tradition and reliability to be competitive advantages.

Fig. 2: Competitive advantage



Source: compiled by the authors

A company's membership of a commercial association might also be seen as a possible competitive advantage. The Chamber of Commerce of the Czech Republic, which represents the commercial public, is one example of a commercial association or federation. This organisation supports all areas of business apart from agriculture, the food industry and forestry, these interests being represented by the Agrarian Chamber of the Czech Republic. The main aim of the chamber is to create opportunities for business and to push through and support measures that contribute to the development of business in the Czech Republic and in turn to the overall economic stability of the state.

Although nobody specifically mentioned this as a competitive advantage, our findings do suggest the relationship of this connection. The independence test was used again when considering the relationship between membership of a commercial association and competitive advantage.

Tab. 5: Test of independence

	Competitive advantage		
Membership of a commercial association	**yes**	**no**	**Row total**
yes	22	38	60
	20.18%	34.86%	55.05%
no	2	47	49
	1.83%	43.12%	44.95%
Column total	24	85	109
	22.02%	77.98%	100.00%

Source: compiled by the authors

It emerges from the tested values and results (table 5) that there is a relationship between membership of a commercial association and a competitive advantage from membership. The degree of dependence can be shown in a contingency coefficient, whose value of 0.3643 makes it a medium dependence. Pearson's coefficient came out at 0.39 (p-value < 0.01). From the obtained results it is evident that the membership of the commercial association (not only in the Chamber of Commerce) can provide a competitive advantage to the enterprise.

2.6 The Rrelationship between Chosen Strategy and Competitive Advantage

This evaluation considers the relationship between the strategy chosen by companies and their competitive advantage. The coding of answers to concern competitive advantage was extended to 10 variables for a more precise identification of dependence. The strategies used by companies were then represented by the following variables: price strategy, innovation strategy, strategy with emphasis on service, strategy with emphasis on quality and other strategies. Hypothesis 0 disproved any relationship between chosen strategy and competitive advantage, whereas hypothesis 1 proved it.

H_0: No relationship between chosen strategy and competitive advantage.

H_1: Relationship between chosen strategy and competitive advantage.

Tab. 6: The relationship between competitive strategy and competitive advantage

Competitive advantage	Price strategy	Innovation strategy	Other	Strategy with emphasis on service	Strategy with emphasis on quality
Other	7	4	5	3	0
	4.40%	2.11%	3.14%	1.89%	0.00%
Know-how	2	7	0	0	0
	1.26%	4.40%	0.00%	0.00%	0.00%
Quality	7	3	1	8	0
	4.40%	1.89%	0.63%	5.03%	0.00%
Marketing	3	0	1	0	0
	1.89%	0.00%	0.63%	0.00%	0.00%
Don't know	3	0	0	1	0
	1.89%	0.00%	0.00%	0.63%	0.00%
Low price	19	0	0	4	0
	10.69%	0.00%	0.00%	2.52%	0.00%
Service	11	2	3	5	1
	6.92%	1.26%	1.89%	3.14%	0.63%
Strong brand	6	0	0	2	0
	3.77%	0.00%	0.00%	1.26%	0.00%
Reliability	0	0	0	0	0
	0.00%	0.00%	0.00%	0.00%	0.00%
Tradition	4	0	0	3	0
	2.52%	0.00%	0.00%	1.89%	0.00%
Column total	62	16	10	26	1
	37.74%	7.55%	6.29%	16.35%	0.63%

Source: compiled by the authors

The statistical values calculated allow us to reject H_0 and accept H_1. The intensity of dependence is given by the contingency coefficient of 0.6874, which is medium. The chosen strategy depends on the competitive advantage which a company has on the market over its competitors.

2.7 The Manner of Competition and Reaction to Competition

The companies were able to judge the way in which competition is manifested most often. They considered the increase in competition, the wider range of goods the competition has, the lower prices offered by the competition, the wider range of services offered by the competition, the use of more advertising and greater emphasis on winning customers and satisfying them. The results are presented in table 7.

A modal value equalling lower prices was calculated using the Statgraphics programme. The degree of mutability was then calculated by hand.

Tab. 7: Frequencies for expressions of competition

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	The increase in competition	60	0.1987	60	0.1987
2	Greater selection of products	30	0.0993	90	0.2980
3	Lower prices	86	0.2848	176	0.5828
4	Greater range of services	29	0.0960	205	0.6788
5	More advertisement	53	0.1755	258	0.8543
6	Greater emphasis on customer satisfaction	44	0.1457	302	1.0000

Source: own

$$M = \frac{n^2 - \sum n_i^2}{n(n-1)} = \frac{302^2 - 17{,}482}{302 + 301} = 0.811,$$

in which M is the number of differences in % and n is the frequency of answers.

With the highest frequency of 86, “lower prices offered by competitors" is therefore the modal value of the most common battle. The variability of opinion on frequent or very frequent competition is rather higher at 81.1 %.

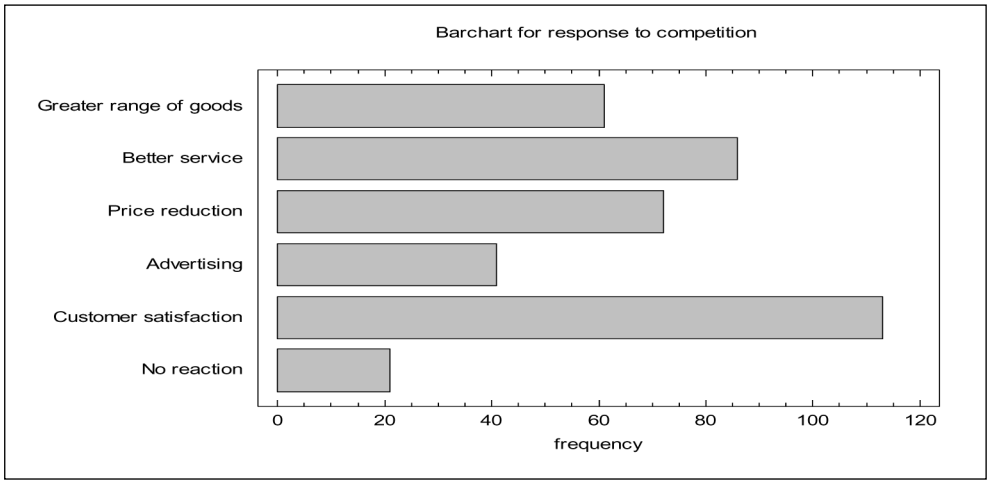
The companies also judged the most common reactions to competition. They chose between a larger range of goods on offer, the introduction (expansion) of services, the reduction of prices, the introduction or intensification of advertising, increasing efforts to ensure a satisfied customer and zero reaction. The results in table 8 and in figure 3 show that the most common response to competition is to better satisfy the customer.

Tab. 8: Response to competition

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	Greater range of goods	61	0.1548	61	0.1548
2	Better service	86	0.2183	147	0.3731
3	Price reduction	72	0.1827	219	0.5558
4	Advertising	41	0.1041	260	0.6599
5	Customer satisfaction	113	0.2868	373	0.9467
6	No reaction	21	0.0533	394	1.0000

Source: own

Fig. 3: Response to competition



Source: own

A modal value equalling the increase in efforts to satisfy customers was calculated using the Statgraphics programme. The degree of mutability was then calculated by hand.

$$M = \frac{n^2 - \sum n_i^2}{n(n-1)} = \frac{394^2 - 31{,}192}{394 + 393} = 0.801,$$

in which M is the number of differences in % and n is the frequency of answers.

The modal value with the highest frequency, 113, is for "increasing efforts to satisfy the customer". The variability of opinion on a frequent to very frequent response to competition is rather higher at 80.1%.

3. Discussion

It ensued from the questionnaire that the competitive environment is very strong in the region throughout the sectors. Over 50% of respondents characterise their competitive environment as very strong and 40% as medium. Some 53.3% of respondents come up against more than 5 competitors. The most common competitive advantages cited by respondents were providing service (28%) and the quality of their products (19%). A detailed investigation confirmed that competitive advantage and competitive strategies need to be understood as multi-dimensional and multi-factored because companies always presented more than one factor in competitive advantage. Neither should we forget the communication undertaken by companies, which must be adapted to suit customers, for example in the social media environment. If companies manage their communication in the way defined, there is a high probability that they will defeat the competition in this progressive channel of communication [20]. Effective use of Internet technology offers many possibilities and advantages for both, companies and their customers. Internet used in communication, marketing activities and sales enables cost reduction and high supply chain effectiveness. It represents a major source of competitive advantage, market penetration and innovation [16]. It emerged from our statistical processing that there is a relationship between the competitive strategy chosen and competitive advantages too.

Conclusion

As presented in the paper, sustainable competitive advantage is one of the deciding factors in the competitive capabilities of business activities at all companies. Competitiveness has become a term that cannot be avoided. It is used by economists, businessmen and politicians. The reason it is used so often could be the fact that it is a word that cannot be replaced. The over-

generality of the expression means that it can be used at several reference levels, at which the meaning often differs, entirely logically.

Whereas competitiveness is reminiscent of effectiveness statically-speaking, dynamically it is very close to economic growth or to flexibility.

The central point that is forgotten when using the term competitiveness is its relativity. This can logically be understood through the causality explained in the section on competitive advantage. There is, after all, a fundamental difference between competitive characteristics and competitive advantage. Competitiveness is thus a reflection of competitive advantages, which are determined by the specific market situation. That is why it is entirely pointless to use the words competitiveness and competitive without specifying them to take into account the specific circumstances involved, based on the actors in the market process and the market environment itself.

Competitiveness can be identified with prosperity, regardless of its relation to the competition. A company which is not competitive does not have a very good chance of long-term survival. There is no theoretical justification for something like this being true.

Research will continue by examining how competitiveness is perceived in relation to the German and Polish parts of the Euroregion Nisa (ERN). We will also consider the competitive environment for companies who wish to undertake business on the German and Polish sides.

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References

[1] BENEŠ, M. *Konkurenceschopnost a konkurenční výhoda* [online]. Centrum výzkumu české konkurenceschopnosti. Working Paper No. 5/2006 [cit. 2013-08-16]. 39 p. (PDF). Available from: http://is.muni.cz/do/econ/soubory/oddeleni/centrum/papers/wp2006-05.pdf. ISSN 1801-4496.

[2] CLARK, J., GUY, K. Innovation and competitiveness: A review. *Technology Analysis & Strategic Management.* 1998, Vol. 10, Iss. 3, pp. 363-395. ISSN 0953-7325.

[3] Euroregion bez hranic [online]. Liberec: Český statistický úřad, Krajská správa ČSÚ v Liberci, c2014 [cit. 2014-02-15]. Available from: http://www.czso.cz/xl/redakce.nsf/i/140206_zsuern.

[4] HOMMEROVÁ, D., KRÁLOVÁ, L. Analýza podpor marketingové činnosti využívaných firmami v České republice. *E+M Ekonomie a Management.* 2009, Vol. 12, Iss. 3, pp. 77-90. ISSN 1212-3609.

[5] IRELAND, R., HITT, M. Achieving and maintaining strategic competitiveness in the 21st century: The role of strategic leadership. *The Academy of Management Executive.* 1999, Vol. 13, Iss. 1, pp.43-57. ISSN 1079-5545.

[6] KADLAS, Z., RŐLC, R. *Analýza socioekonomického rozvoje Libereckého kraje se specifikací potřeb po roce 2013 z hlediska kohezní politiky* [online]. Agentura regionálního rozvoje, c2010 [cit. 2014-02-02]. 38 p. (PDF). Avaible from: http://www.strukturalni-fondy.cz/getmedia/ca8be48d-b7a6-4f2f-8b5c-ebc195598ed5/Analyza-SE-rozvoje-Liberecky_loga.pdf.

[7] METCALFE, J.S., RAMLOGAN, R., UYARRA, E. Economic Development and the Competitive Process. *Manchester Centre on Regulation and Competition. Working Paper Series.* 2002, No. 36. 31 p. Available also form: http://www.sinal.redesist.ie.ufrj.br/globelics/pdfs/GLOBELICS_0069_Metcalfeetalli.pdf.

[8] MUSOVÁ, Z. *Spoločenská zodpovednosť v marketingovej praxi podnikov.* Banská Bystrica: Univerzita Mateja Bela, Ekonomická fakulta, 2013. 228 s. ISBN 978-80-557-0516-3.

[9] PACE, R., STEPHAN, E. Paradigms of competitiveness. *Competitiveness Review.* 1996, Vol. 6, Iss. 1, pp. 8-13. ISSN 1059-5422.

[10] PLCHOVÁ, J. Alternatívne prístupy k manažmentu podniku. In *Aktuálne otázky ekonomických a humanitných vied ´10.* Actual Questions of Economic and Human Sciences ´10: Zborník príspevkov z interdisciplinárneho vedeckého kolokvia. Bratislava, 17. december 2010, SR. 1. vyd. Bratislava: STU v Bratislave, 2011. pp. 309-314. ISBN 978-80-227-3447-9.

[11] POLIAČIKOVÁ, E. *Manažment kľúčových zákazníkov.* 1. vyd. Bratislava: IURA Edition, 2012. 101 p. ISBN 978-80-8078-451-5.

[12] PORTER, M.E. *Konkurenční výhoda.* Praha: Victoria Publishing, 1993. 626 p. ISBN 80-85605-12-0.

[13] PORTER, M.E. *Konkurenční strategie.* Praha: Victoria Publishing, 1994. 403 p. ISBN 80-85605-11-2.

[14] PRADO, J. Increasing competitiveness with continuous improvement. *Industrial Management.*

1997, Vol. 39, Iss. 4, pp. 25-27. ISSN 0019-8471.
[15] PŮLPÁNOVÁ, L., SIMOVÁ, J. Faktory spokojenosti zákazníků v cestovním ruchu. *E+M Ekonomie a Management.* 2012, Vol. 15, Iss. 4, pp. 160-169. ISSN 1212-3609.
[16] SIMOVÁ, J. Customers' online shopping attitudes in relation to their online shopping experience. In KOCOUREK, A. (ed.). *Liberec Economic Forum 2013: Proceedings of the 11th International Conference: 16th – 17th September 2013, Sychrov, Czech Republic, EU.* pp. 495-503. ISBN 978-80-7372-953-0.
[17] SUCHÁNEK, P., ŠPALEK, J. Competitiveness of Companies in the Czech Republic. *The Business Review.* 2008, Vol. 11, Iss. 2, pp. 192-199. ISSN 1553-5827.
[18] SUCHÁNEK, P., ŠPALEK, J., SEDLÁČEK, M. Competitiveness Factors in Post-transformation Period: The Case of Czech Enterprises. *European Research Studies Jornal.* 2011, Vol. 14, Iss. 1, pp. 119-143. ISSN 1108-2976.
[19] SZENTES, T. Interpretations, Aspects and Levels, Decisive Factors and Measuring Methods of Competitiveness. *Society and Economy.* 2005, Vol. 27, Iss. 1, pp. 5-41. ISSN 1588-9726.
[20] UNGERMAN, O., MYSLIVCOVÁ, S. *Identification of Factors which Influence Satisfaction with Corporate Communication Delivered through Social Media.* International Conference on Management, Leadership and Governance. 1st ed. Bangkok University, Thailand, 2013. pp. 400-407. Available also from: http://issuu.com/acpil/docs/icmlg-13-proceedings.3. ISSN 2049-6826.
[21] VOKURKA, R., DAVIS, R. Improving manufacturing competitiveness: A case study. *Competitiveness Review.* 1996, Vol. 6, Iss. 1, pp. 68-77. ISSN 1059-5422.
[22] ZICH, R. Koncepce úspěchuschopnosti a její pojetí strategie. *E+M Ekonomie a Management.* 2010, Vol. 13, Iss. 1, pp. 60-75. ISSN 1212-3609.

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Abstract

THE COMPETITIVE ENVIRONMENT AMONG COMPANIES IN THE CZECH PART OF EUROREGION NEISSE-NISA-NYSA

Jaroslava Dědková, Klára Blažková

The paper concentrates on the characteristics of the competitive environment in the Czech part of Euroregion Nisa and a constituent part of the outcome of a specific research project at the Faculty of Economics at the Technical University in Liberec.

It can be assumed that a company that wants to succeed on the market must use its competitive advantage and develop its competitiveness. This is based on the ability to respond quickly and correctly to the requirements of customers and competing companies. Competitiveness means a company generating competitive advantages faster than its competitors.

The authors look at the question of which competitive advantages exist among the companies in ERN, what is important to companies and what relationship there is between competitive advantages and the competitive strategies used.

The introduction to the paper presents methodological approaches to the topics of competitive strategies and the competitive environment from the perspective of experts on the matter. The main aim of the paper is to identify and characterise the competitive environment of companies in the Czech part of Euroregion Nisa based on an evaluation of data from primary questioning. The authors of the paper deal with the issue of the main competitive strategies that companies now use and in what lies their competitive advantage. Results and discussion are found in an evaluation of primary research undertaken among 170 companies in the Czech part of Euroregion Nisa. A detailed investigation confirmed that competitive advantage and competitive strategies need to be understood as multi-dimensional and multi-factored. There are several "key" types of competitive advantage, their number and order of importance depending on many circumstances; for example a company's sphere of activity, the area of business activity, the size of the company, the requirements of owners and customers, the priorities of management and so on. Each industry uses its own competitive advantage differently and the decisive factor is succeeding with customers.

It can be contended that successful companies need to produce differentiated products at low cost and need to be flexible.

Key Words: *Competitiveness, survey, competitive advantage, competitive strategy.*

JEL Classification: *M31.*

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THE FUNCTIONALITY COMPARISON OF THE HEALTH CARE SYSTEMS BY THE ANALYTICAL HIERARCHY PROCESS METHOD

Vincent Šoltés, Beáta Gavurová

Introduction

Hospitals are the weakest segment of the Slovak health care system. Their basic problems are evident in outdated material-technical base, demotivation of physicians, lack of care for the chronically and severely ill patients, regulated and non-competing system of health insurance companies, dysfunctional system of trainings for physician and health professionals. Health care providers (HCP) assess the current health care system as completely unstable. The long-term negative phenomena of the most Slovak hospitals is their loss making management, which affects the condition of the buildings, equipment, reward system, as well as the working conditions, the logistics system of medicines, medical materials, etc. There is a long term absence of the investment resources, which were in the past covered by the capital subsidies from the State budget. Hospitals suffer from the rapid lack of investment capital into the buildings, technologies and specialized equipment. This problem is closely related to the insufficient development of innovation and development of highly specialized health care. One of the possible savings of health insurance companies' funds is introducing day surgery option, respectively day surgery, which would be beneficial also for patients. It is also supported by the government's program of the Ministry of Health of the Slovak Republic (MH SR) under the reduction of beds in hospitals and declared highly effective treatment consisting of cured patients for the shortest possible time, without unnecessary pain and stress, but of the highest quality, without unnecessary hospital infections appearance and with as low as possible expenses. Day surgery has its proponents, but also opponents. Positive or negative opinion on its use in Slovakia depends on who is assessing it: health insurance companies are seeking for efficient use of available financial resources in hospitals, but those are permanently in debt [13]. Health insurance companies contribute with significantly reduced payments for services of day surgery against the payments for completed hospitalization. The reason is poorly constructed and economically de-motivating system that significantly lags behind the European average. Health systems need to be assessed comprehensively, since the adoption of measures only in one area may substantially affect the other areas and cause many adverse effects, possibly with the worse implications than before the change itself [14]. To search for alternatives in the process of increasing the efficiency of the health care system in Slovakia it is necessary to launch a broad debate about the whole system [2], [10] and its functionality, to set up the goals, to provide all required and objective analyzes [19], to search for all possible variants of solutions [39], to reach an agreement and particularly to meet the agreed rules by all involved stakeholders in order to meet the targets [31], [20], [24], [38]. There are very few studies based on comparison of traditional hospitalization with performances provided during day surgery [5]. Those that have been realized show no significant differences in the results (e.g. [5], [6], [9], [11], [17]. Their conclusions focus mainly on the safety dimension of day surgery performance, also on the subject in compliance with all recommended

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instructions and organizational principles of the day surgery program.

1. Day Surgery in Slovak Republic and Abroad

At the present, in Slovakia is day surgery more increasingly considered as a standard planned procedure, it can be advantageous not only for the patient and his family, but also for health care provider. „Day surgery" is defined as a surgery or procedure, when the patient is admitted or released from surgical care on the same day [1]. Stay in the hospital during the night up to 23 hours is termed as „prolonged recovery" [1]. A term „short stay" is used for surgery, where required hospital stay takes more than 23 hours, but no longer than 72 hours [18]. Despite of IAAS efforts to standardize international terminology to facilitate comparisons of surgical data between the countries, there are still the differences. There is no standardized terminology of day surgery procedures, as well as the places of their realization, places and length of recovery after procedures and so on. Development of high quality day surgery care services in European countries is also a priority for their governments in health care field. A recent survey conducted in 19 countries pointed to the significant differences in the percentage of realized procedures of day surgery [34]. Their range varies from less than 10% (e.g., Slovakia and Poland), to the around 80% (such as USA, Canada) [7], [29], [34]. These differences are evident between the countries but also within the countries, between the hospitals in the concrete country, in its departments, as well as between the specialists in the equal hospital. As the most determining factor of stated differences could be indicated the existence of different rules and incentives in different countries, different financial payments for day surgery, doctors resistance (including anesthesiologists) to the changes in the implementation of new procedures and the like (e.g. [21], [30]). IAAS (International Association for ambulatory surgery) recommends also a subsequent benchmarking for day surgery quality assessment based on selected types of indicators, such as cancellation of planned procedures, unplanned admission to the hospital, re-admission to the surgical procedure (ambulatory or hospital), patient satisfaction with the surgery performance and the like.

1.1 Critical Aspects of Day Surgery in Slovak Republic

Previous researches of day surgery use in Slovakia [13], [14] declare the fact that although day surgery is a highly effective instrument for providing health care, it is applied in unstable conditions of Slovak healthcare system. It is a suitable subject for polemics of various representatives of the health care system, as well as the professional and general public, who does not have adequate information. Information also absent on the web pages of individual health insurance companies. Day surgery is carried out under the professional guidance of the Ministry of Health of the Slovak Republic issued in 2006. At that time, about one third of the patients, especially in large public hospitals were hospitalized less than 72 hours.

Foreign studies in the countries, where day surgary system is functioning for more than 30 year ([23], [35], [8], [12], [16] etc.) declare numerous researches in this field, supporting continuous improvement of day surgery system. We can see a problematic aspect of day surgery development in Slovakia in the lack of financial support from health insurance companies, which each year expand the list of day surgery performances, but without mapping the conditions of its appropriateness. In the fifteen years of day surgery existence in Slovakia, there were not done any researches declaring its condition, as well as potential development opportunities. There is not research mapping the riskiness of the selected types of procedures for different age groups of the patients, the cost increase of treatment for patient re-hospitalization after the procedure, the overall benefits of day surgery use compared to the standard hospitalization with the concrete type of diagnosis (cost savings of health insurance company), including the patient's early return to the working process. Problems can also be found in the primary data collection, where in reporting frequencies of day surgery performance based on the guidelines of MH SR we find many inconsistencies and incompatibilities. All critical aspects were the important determinants in our expert evaluation, which was the preparatory phase of the application of Analytic Hierarchy Process (AHP) in the process of comparison of the two health care systems. Application of AHP is further elaborated in Chapter 2.

1.2 Day Surgery in the Process of Beds Reduction in Health Care System

In connection with the day surgery development is necessary to mention the process of the hospital beds reduction. Reducing the number of hospital beds previously used for inpatient care can be considered from a financial perspective as an important benefit of day surgery. Slovakia is among the OECD countries with the lowest efficiency of health care, while in the number of beds per 1,000 inhabitants is above the average of the OECD [37]. Reduction of the hospital beds was repeatedly planned by previous governments in Slovakia, touching also the hospitals that were not intended to be cancelled. Although, the expected output of rationalization of hospitals in the long run in conjunction with other measures, which should increase the performance management of public resources in the health sector, strives to the increasment of the quality and accessibility of health care for citizens, it can also cause a transitory exacerbation of the access to the health care. As reported by the National Health Information Center (NHIC) statistics, since 2000 is reported a decline trend of the number of hospital beds in all segments (acute, psychiatric as well as beds for long-term patients). Between the years 2000–2007 there was a reduction of beds by 37.3% (in 2000 was their number 42,332 and in 2007 a total of 26,546 beds). Decrease in the number of beds was also reflected in the decline of the number of employed physicians by 13.2% (from 6,143 to 5,334), as well as the reduction of other medical personnel [36], [37]. In 2011, the General Health Insurance Company reduced about 3,000 unnecessary beds and has not contracted about 150 hospital departments, which were often duplicated or ineffective. Despite of the referred rationalization actions, Slovakia remains in ranking among the OECD countries with the lowest efficiency of health care, while in the total number of hospital beds per 1,000 inhabitants is above the average of OECD countries (even in acute beds) [36]. It is apparent from the above that the scope for further hospital rationalization exists, although the process of reduction of beds causes a critical controversy among the experts in the sense, that stated system of saving finances is liquidating for hospitals. After the reduction of beds was expected a lower supply of funds from health insurance companies, which would jeopardize the ability of hospitals to pay their liabilities. Finally, the hospital would get more into the debt, because even at the lower inflow of the finances, they will have to cure the patients.

2. Comparison of Health Care Systems in Hospitals

Day surgery in Slovakia and abroad benefits from the positive results of several studies and medical practice declaring the fact, that the best ongoing treatment and recovery of patients after surgery is at home environment. Modern medicine, as well as ongoing development of operational techniques and related methods of the post-operative care, enables to shorten hospital stay to a minimum and it prompts to return to the normal life [32]. Current educational modalities limit the negative influence of interindividual variability of surgical skills, thus increasing the potential for uncomplicated postoperative course [4]. However, the most standard, uncomplicated surgeries in Slovakia are accompanied by unnecessarily long hospital stay. When evaluating the day surgery efficiency it is necessary to bear in mind that the financial savings occur when the hospitalization surgeries substitute the execution of day surgery performances and bed are reduced. Day surgery efficiency depends on many factors: pricing strategies of health insurance companies, place of day surgery performance, the patient age, comorbidities [33], degree of technical failure of the surgeon, social aspects and so on [3], [8] [15], [16], [35]. The heterogeneity of these factors on the one hand makes the process of day surgery performances significantly difficult to compare with the system of inpatient care. But in the individual components of the functioning of both systems are clear unambiguous criteria that are necessary to ensure the functionality of the process of health care providing. To compare those two systems, we have choosen already mentioned AHP method.

2.1 AHP in the Process of Comparing Health Care Systems

AHP is a structured technique designed to solve a complex decision. It is based on mathematical procedures and human psychology. Since its

first publication in the 70s of the 20th century, it has undergone several improvements and it provides complex and coherent approach to the structuring of the problem, to quantify the elements related to the overall objectives and evaluates an alternative solutions. AHP can be used in various decision-making situations spheres (government, business, industry, health, education).

AHP method is based on the creation and analysis of hierarchical structure of the solving task. By the hierarchical structure of the term we understand to the structure, containing a number of levels, where each of them contains several elements. The arrangement of the different levels of hierarchical structure corresponds with the way of the arrangement from the general to the specific. The more general elements are in relation to that decision-making problem, the higher level of hierarchy they get. The typical simple task of multicriteria option analysis includes the following levels:

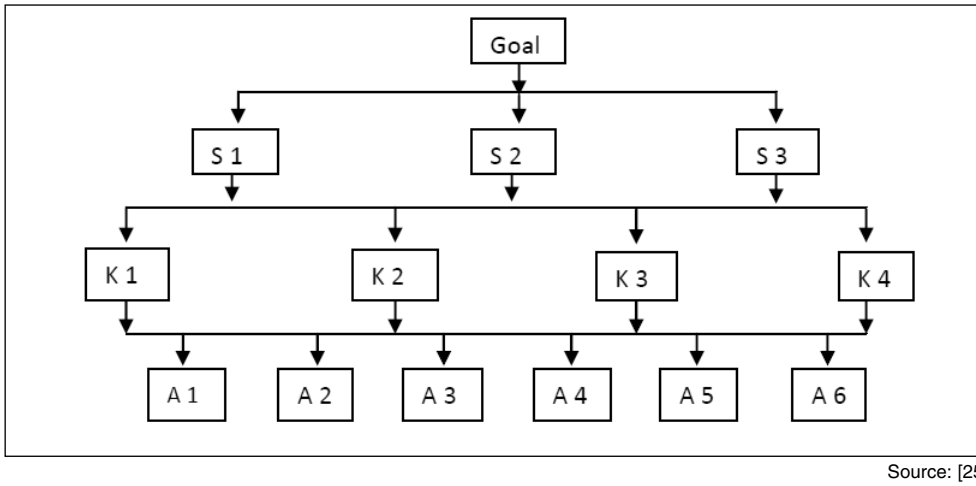
- first level – objective evaluation, which could be the arrangement of variants,
- second level – evaluation criteria,
- third level – assessed variants.

When quantifying relations in the hierarchy, it usually progresses from the top to the bottom. The method of quantitative pair comparison by Saaty is used; it is based on the importance of comparing all pairs of elements evaluation [25], [26], [28]. The output of AHP is important for the evaluation of criteria, therefore it is very important to pay attention to the procedures which helps to determine weights of the criteria responsibly and exactly. For decision making are also important experiences, it helps to sort out evaluation criteria for monitoring so-called informative signs, which provide largest volume of real information for deciding. Decisions made on the base of the best decision-making method may not be correct; if the input data in preparation phase are not perfectly managed and sufficient quality information are missinf. In the first phase, before applying the method of evaluating, the evaluating entity has to define all criteria and sub-criteria under which the evaluation will take place. Selection of individual criteria and sub-criteria is carried out on the basis of current knowledge and experiences of each evaluating entity. If it is a very first evaluation of some entity, the criteria must be sorted out more or less according to its own intuition, respectively according to some evaluating subject template, or according to the tasks that is the subject of decision making.

2.1.1 The Structure of the AHP Method

Method of AHP is a flexible model for decision making, clarifying issues that have several possible solutions. AHP is carried out by an expert method and then by a mathematical method, which divides main problem into the smaller and more detailed elements. Decision making by the method of AHP can be divided

Fig. 1: Four-level hierarchy of AHP



Source: [25]

into three different levels [25]: 1) hierarchy, 2) priorities, 3) consistency.

Hierarchy – decomposition of the properties into homogeneous clusters and then further dividing into smaller units, we can gradually integrate a large amount of information into hierarchical structure, creating a more complete picture of the system. Hierarchy on Figure 1 represents a problem of multicriteria decision making.

Setting priorities – to determine the intensities of the impact effect of various components on the system as a whole, we need to transfer a certain types of measurement. AHP allows comparing and measuring the intangible qualitative factors (e.g. social, political, etc.). In absolute comparisons are compared the alternatives with the established standard, which was developed on the basis of past experiences. In relative comparisons are alternatives compared in pairs usually through the commonly used evaluation terms (e.g. worse, better, etc.). AHP uses for both types of comparisons, cardinal scales are stated in Table 1.

Tab. 1: Basic scales for pair comparison

Evaluation degree	Comparison of elements x and y	Explanation
1	x is as important as y	Both elements contribute equally to the result
2	x is less important as y	The first element is slightly more important than the other
3	x is slightly important than y	Experiences and assuming slightly prefer the first element before the second
4	x is slightly more important than y	Slightly stronger preference than the previous
5	x is strongly more important than y	Strong preference of the first element before the second
6	x is much more strongly important than y	Slightly stronger preference than the previous
7	x is very strongly important than y	Very strong preference of the first element before the second
8	x is very, very strongly more important than y	Slightly stronger preference than the previous one
9	x is extremely more important than y	The facts that prefer the first element over the second one have the highest evidential level.

Source: [25]

Information about the significance of the criteria obtained on the base of the paired comparison can be determined as the values s_{ij}, which indicates the ratio of the significance of the evaluation criteria k_i to criterion k_j, where i,j = 1,2,...,n. It is required that sij meets for all i, j = 1,2,...n, where n is the number of evaluation criteria, under the following conditions [25]:

$$s_{ij} > 0,\ s_{ij} = s_{ji}^{-1},\ s_{ii} = 1 \qquad (1)$$

Variables s_{ij}, relative significance of criteria have to be arranged in a square matrix of relative significance **S**.

$$S = \begin{pmatrix} s_{11} & s_{12} & \cdots & s_{1n} \\ s_{21} & s_{22} & \cdots & s_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ s_{n1} & s_{n2} & \cdots & s_{nn} \end{pmatrix}$$

Consistency – in determining the relations between the objects, the coherence have to be achieved, i.e. consistency of mutual relations. This coherence is achieved by homogeneity (relevancy) manifested in homogeneous clustering of the objects according to given criteria, as well as consistency of intensity of relations between the objects according to different criteria. The alternatives of decision are sorted out in order of evaluation [27].

As reported by Saaty and Joyce [26], when using AHP method for decision making, four axioms have to be met:

- *Inverse axiom:* if an alternative A is n-times preferred to B, then B alternative is 1/n-times preferred to A. It is a rule of reciprocity expressed by the formula:

$$s_{ij} = \frac{1}{s_{ji}}, \qquad (3)$$

- *Homogeneous axiom:* comparison using pairing is significant only if the elements are comparable.
- *Dependent axiom:* comparison at a lowest level (sub-criterion) depends on the element at a higher level (the higher criterion), the rule of transitivity.
- *Consequential axiom:* if any criterion in the hierarchy will be changed, new re-valuation for the new hierarchy is expected.

In practical application of method AHP, the elements of decision matrix, are very often not consistent. So there is needed to calculate inconsistency index, expressed by the formula [25]:

$$I_S = \frac{\lambda_{\max} - n}{n-1} \qquad (4)$$

where λ_{max} is the biggest eigenvalue of matrix S and n is its dimension. If $I_s = 0$, than the matrix is consistent.

The higher the values of inconsistency index (I_s) acquires, the more inconsistent are the pairwise comparisons in the matrix of paired comparisons. In case of higher inconsistency Saaty recommends, that expert should reconsider its assessment of criteria and modify the matrix of relative significances S, to increase its consistency [27]. On the contrary, the closer to zero is the value I_s, the greater is the consistency of the pairwise comparisons in matrix. In practical application Saaty recommends to accept the value of inconsistency index lower than 0.1, as it was applied in our calculations.

2.2 Practical Application of AHP – Determination of Criteria and Sub-Criteria

The subjects of our analysis are healthcare systems, namely day surgery and inpatient (traditional) health care. Heterogeneity of those health care systems makes it significantly difficult to compare them in the hospitals. Determination of criteria and sub-criteria of both health care systems was carried out by the expert evaluation, 16 experts participated (3 were the members of the Slovak Association of Day Surgery, 4 health insurance companies representatives, 4 representative of the Association of Hospitals in Slovakia (AHP), 4 health care were providers with real experience with day surgery performance and 1 representative was from the university sphere). At the beginning of this process, experts have identified a set of criteria; there was no exact evaluation of individual elements between them. We obtained a list of the components of health care systems, which are not mutually valued between them, so in this time they had the same weight. Based on the expert evaluation, the following basic criteria were specified: strategic focus, system stability, measurability, causality, coherence with funding sources, system sustainability and feedback, and self-evaluation of the health care system (Table 2). These criteria were also the basic principles of health care (day surgery and in-patient care) and a platform for subsequent expert evaluation of the AHP. Adherence with those principles in the analyzed systems is conditional for achieving the expected benefits from them. These principles are based on the fundamental principles of the both, health care systems functioning, from their comparative aspects, as well as from the results of the own research activities [13], [14], The above stated principles represent the evaluation criteria, to which the group of experts from our research subsequently established a set of so-called sub-criteria (Table 2).

Tab. 2: Set of health care systems functionality criteria based on expert evaluation

Criterion	Criterion title
K1	Strategic objective of health care system
K2	Stability of health care system
K3	Measurability
K4	Causality
K5	Coherence with funding sources
K6	Continuity, sustainability and feedback
K7	Self-evaluation of health care

Source: own

Listed criteria are relatively widely understood. For this reason, it is necessary that in the process of defining the criteria, the experts should break down those criteria into sub-criteria to the level where it is necessary. The level of the segmentation is unlimited. In this case, we have chosen to break down the criteria only to one lower level, to the sub-criteria. In practice it is possible that these sub-criteria will be subdivided to other sub-sub-criteria. For the second level of sub-criteria were based on expert estimation of the expert group set the items shown in Table 3 From the table is also clear the competence of the various sub-criteria to the main criteria.

Tab. 3: Set of health care systems functionality sub-criteria based of expert evaluation (part 1)

Sub-criterion	Sub-criterion title
S1.1	Implementation of the consistent strategic analysis and assessment of the appropriateness of the health care system for current conditions in the Slovak healthcare
S1.2	Consensus on a vision and/or mission and/or critical success factors
S1.3	Regular analysis and assessment of the overall strategic performance of the hospital
S1.4	Revising the existing strategic areas and the possibility of accepting other potential strategic areas
S1.5	Support of the major decision-making organization managements (MZ SR, health insurance companies, The Healthcare Surveillance Authority, AHS) when using health care system and their participation on the relevant results of the health care system
S2.1	Regular redefinition of the objectives and actions within the health care system
S2.2	Defined objectives reflect the equilibrium view on the strategy for hospital
S2.3	Defined strategic actions reflect the equilibrium view on the strategy of the hospital
S2.4	Regular analysis and evaluation of the balance between existing strategic measures
S3.1	To the strategic objective are assigned appropriately chosen strategic measure methods of the values measuring
S3.2	To the strategic measures are assigned their target values and critical values
S3.3	Specified conditions and terms of regular quantification of the measures
S3.4	Regular analysis and evaluation of existing measures, target and critical values, measures and choice of other potential target and critical value of measures
S4.1	Causal relationships are defined between the strategic perspectives
S4.2	Causal relationships are defined between the strategic objectives
S4.3	Causal relationships are defined between the measures
S4.4	Causal relations are defined between the targeted and critical values of strategic measures

Tab. 3: Set of health care systems functionality sub-criteria based of expert evaluation (part 2)

Sub-criterion	Sub-criterion title
S5.1	Defined strategy and subsequent planes are linked to the state budget of SR
S5.2	Hospital sources are within the system of day surgery aligned with strategic actions, respectively strategic initiatives
S5.3	Non-strategic investments, respectively non-strategic activities were selected and eliminated by introduction of new forms of healthcare
S5.4	Results of analyzes affect the review of the strategy, i.e. strategic objectives and resources
S5.5	Regularly are analyzed and evaluated links to the sources of hospitals to the strategic activities identified in the health care system
S5.6	Based on the results of analysis and revisions of the strategic assumptions, if necessary, we revise existing links of budget and strategy of day surgery system
S6.1	Project to establish health care system was planned in detail from the methodological, technical and organizational perspective
S6.2	The introduction of the health care system had the full support and participation from the side of superior units and relevant organizations s
S6.3	For day surgery functioning was chosen and implemented an appropriate information system
S6.4	Extending health care system within the hospital was managed and controlled process
S6.5	Leadership of organizations supports the use of the health care system and participates in the relevant results
S6.6	Continuous operation of the health care system and regular reporting is ensured
S7.1	For the introduction of the health care system was elaborated cost analysis and/or analysis of risk and benefits
S7.2	Conditions and rules for the regular evaluation of the health care system in terms of benefits, risks, and cost-effectiveness were specified
S7.3	The health care system is regularly analyzed and evaluated - its benefits, costs, gaps, risks and so on.
S7.4	In case of revising conditions and rules of functionality and their use of health care system, an effort for continuous improvement is registered

Source: own

In the first round of the expert evaluation were defined criteria and sub-criteria. Subsequently, the experts were provided with the lists of criteria and sub-criteria in order to assess their importance. The experts could assign a degree of importance to criteria and sub-criteria from 1 (absolutely important) to the level 9 (totally unimportant). Experts were given a table of criteria and sub-criteria and then using the modal criterion, the importance of each criterion was evaluated. Results are stated in the following Table 4.

Consequently, using these links between those criteria and sub-criteria we determined the elements of matrix. Value matrix **S** is defined precisely on the basis of mutual comparison of the criterion importance, respectively associated sub-criteria. E.g. when criterion K1 is as important as criterion K2, the value of mutual evaluation of these criterions in matrix S is 1. Criterion K1 is one level upper than criterion K4. So in a row K1 and a column K4 is number 2. In a row K4 and a column K1 is reverse value of 2, so 0.5, as K4 is one level lower than K1. Analogically we can evaluate pairs of criterions. Thus, we can define the values as relative differences of importance. When creating a matrix, it is important to preserve the rule of transitivity. In our case, attribute K1 is one degree more important than attribute K4 ($s_{14} = 2$) and attribute K4 which is one degree more important than K7 ($s_{47} = 2$). Based on the transitivity rule it must apply, that an attribute K1 is 2 degrees more important than attribute K7 ($s_{17} = 3$).

Tab. 4: Ranking of criteria and sub-criteria specified by expert evaluation

Table of ranking criteria and sub-criteria in order of importance								
Criteria and sub-criteria		**Sub-criteria S1.X**	**Sub-criteria S2.X**	**Sub-criteria S3.X**	**Sub-criteria S4.X**	**Sub-criteria S5.X**	**Sub-criteria S6.X**	**Sub-criteria S7.X**
Criteria	K1, K2, K3, K4, K5, K6, K7	S1.1, S1.2, S1.3, S1.4, S1.5	S2.1, S2.2, S2.3, S2.4	S3.1, S3.2, S3.3, S3.4	S4.1, S4.2, S4.3, S4.4	S5.1, S5.2, S5.3, S5.4, S5.5, S5.6	S6.1, S6.2, S6.3, S6.4, S6.5, S6.6	S7.1, S7.2, S7.3, S7.4
Degree of importance	**Assigned criteria**	**Assigned sub-criteria**						
1. Absolutely important								
2. Very strongly important	S1.1, K1, K2, K3	S1.2.	S2.4.		S4.1, S4.2, S4.4.	S5.1, S5.2, S5.4, S5.5.	S6.3, S6.4, S6.6.	S7.1
3. Strongly important	K4, K5, K6	S2.2, S1.5	S2.3		S5.3, S4.3.	S6.2, S5.6.	S7.2, S6.5.	S7.4.
4. Important	K7	S1.3, S1.4.	S2.1	S3.4.			S6.1.	S7.3.
5. Weakly important				S3.1, S3.3.				
6. Not important				S3.2.				
7. Strongly unimportant								
8. Very strongly unimportant								
9. Absolutely unimportant								

Source: own

It can also be exactly written. Let k_i represents an evaluation of the importance of i-th criterion/ /sub-criteria. Mutual evaluation of the importance of the two criteria/sub-criteria then can be defined as s_{ij}, as criterion i is more important than criterion j which is stated by the formula:

$$s_{ij} = k_j - k_i + 1 \text{ if } k_i < k_j, \quad (5)$$

$$s_{ij} = 1 / (k_i - k_j + 1) \text{ when } k_i > k_j. \quad (6)$$

Weights are stated as:

$$w_i = \frac{\sum_{j=1}^{m} s_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{m} s_{ij}}$$

where m is an index of a superior main criterion.

Results are written in table 5 and table 6.

Tab. 5: **Matrix S for basic criteria**

	K1	K2	K3	K4	K5	K6	K7	Weights
K1	1	1	1	2	2	2	3	***0.2034***
K2	1	1	1	2	2	2	3	***0.2034***
K3	1	1	1	2	2	2	3	***0.2034***
K4	0.5	0.5	0.5	1	1	1	2	***0.1102***
K5	0.5	0.5	0.5	1	1	1	2	***0.1102***
K6	0.5	0.5	0.5	1	1	1	2	***0.1102***
K7	0.33	0.33	0.33	0.5	0.50	0.5	1	***0.0593***

Source: own

Tab. 6: **Matrices S for individual sub-criteria**

S1.X	S1.1	S1.2	S1.3	S1.4	S1.5	Weights
S1.1	1	1	3	3	2	***0.3409***
S1.2	1	1	2	2	1	***0.2386***
S1.3	0.33	0.33	1	1	0.5	***0.108***
S1.4	0.33	0.33	1	1	0.5	***0.108***
S1.5	0.5	0.5	2	2	1	***0.2045***

S2.X	S2.1	S2.2	S2.3	S2.4	Weights
S2.1	1	0.5	0.5	0.3	***0.1205***
S2.2	2	1	1	0.5	***0.2328***
S2.3	2	1	1	0.5	***0.2328***
S2.4	3	2	2	1	***0.4139***

S3.X	S3.1	S3.2	S3.3	S3.4	Weights
S3.1	1	2	1	0.5	***0.2328***
S3.2	0.5	1	0.5	0.33	***0.1207***
S3.3	1	2	1	0.5	***0.2328***
S3.4	2	3	2	1	***0.4138***

S4.X	S4.1	S4.2	S4.3	S4.4	Weights
S4.1	1	1	2	1	***0.2857***
S4.2	1	1	2	1	***0.2857***
S4.3	0.5	0.5	1	0.5	***0.1429***
S4.4	1	1	2	1	***0.2857***

S5.X	S5.1	S5.2	S5.3	S5.4	S5.5	S5.6	Weights
S5.1	1	1	2	1	1	2	***0.2***
S5.2	1	1	2	1	1	2	***0.2***
S5.3	0.5	0.5	1	0.5	0.5	1	***0.1***
S5.4	1	1	2	1	1	2	***0.2***
S5.5	1	1	2	1	1	2	***0.2***
S5.6	0.5	0.5	1	0.5	0.5	1	***0.1***

S6.X	S6.1	S6.2	S6.3	S6.4	S6.5	S6.6	Weights
S6.1	1	0.5	0.3	0.33	0.5	0.33	***0.068***
S6.2	2	1	0.5	0.5	1	0.5	***0.125***
S6.3	3	2	1	1	2	1	***0.2273***
S6.4	3	2	1	1	2	1	***0.2273***
S6.5	2	1	0.5	0.5	1	0.5	***0.125***
S6.6	3	2	1	1	2	1	***0.2273***

S7.X	S7.1	S7.2	S7.3	S7.4	Weights
S7.1	1	2	3	2	***0.4138***
S7.2	0.5	1	2	1	***0.2328***
S7.3	0.33	0.5	1	0.5	***0.1207***
S7.4	0.5	1	2	1	***0.2328***

Source: own

Since not all individual elements of matrices are consistent, we calculated the indexes of inconsistency. Calculation was carried out by using of the program tool MS Excel and acquired results are shown in Table 7.

Tab. 7: Inconsistency index of main criterions and sub-criterions

I_K	I_{s1}	I_{s2}	I_{s3}	I_{s4}	I_{s5}	I_{s6}	I_{s7}
0.001731	-0.06141	-0.00626	0.00249	0	0	-0.00166	0.00249

Source: own

Table 7 shows that pairwise comparisons of criteria and sub-criteria are sufficiently consistent, because all indexes of inconsistency are in absolute value smaller than 0.1. Our suggested criteria and sub-criteria rated by experts are thus suitable for evaluating by using AHP method.

2.3 Evaluation of Variants (Standardized and Non-Standardized Evaluation)

In the second part of the implementation of the expert evaluation we conducted individual evaluation of both variants, namely day surgery system and hospitalization system of health care. Experts on such matters evaluated both variants separately for each sub-criterion. While using rating scales from 0 to 5, where 5 represents the best value (most appropriate option) and the worst value of 0 (worst possible option). Individual variants were evaluated by non-standardized and by standardized method. When using standardized method, the figures obtained from experts were divided into the intervals. Respecting the recommendation of paper [27], we divided the interval <0,5> into 8 equal intervals, which are characterized in Table 8.

Tab. 8: Intervals of standardized evaluation of alternatives

Points	1.	2.	3.	4.	5.	6.	7.	8.
From	0	0.625	1.25	1.875	2.5	3.125	3.75	4.375
To	0.625	1.25	1.875	2.5	3.125	3.75	4.375	5

Source: own

Concrete values, which were obtained from the experts and then transformed into the intervals, according to Table 8 are shown in Table 9.

Tab. 9: The sub-criteria values and their classification into intervals

		x_{ij}	Interval			x_{ij}	Interval			x_{ij}	Interval
S1.1	A	2.4	4.interval	S2.3	A	3.2	6.interval	S4.2	A	3.1	5.interval
	B	2.4	4.interval		B	3	5.interval		B	3	5.interval
S1.2	A	2.5	4.interval	S2.4	A	3.3	6.interval	S4.3	A	3.2	6.interval
	B	2.3	4.interval		B	3.1	5.interval		B	3.1	5.interval
S1.3	A	2.8	5.interval	S3.1	A	3.1	5.interval	S4.4	A	3.1	5.interval
	B	2.1	4.interval		B	3	5.interval		B	3.5	6.interval
S1.4	A	2.5	4.interval	S3.2	A	2.9	5.interval	S5.1	A	2.8	5.interval
	B	2.7	5.interval		B	2.9	5.interval		B	2.2	4.interval
S1.5	A	2.8	5.interval	S3.3	A	2	4.interval	S5.2	A	3.2	5.interval
	B	2.7	5.interval		B	2.3	4.interval		B	3	5.interval
S2.1	A	2.9	5.interval	S3.4	A	2.3	4.interval	S5.3	A	3	5.interval
	B	2.9	5.interval		B	2.2	4.interval		B	2.9	5.interval
S2.2	A	3.1	5.interval	S4.1	A	3.8	7.interval	S5.4	A	2.7	5.interval
	B	3	5.interval		B	3.6	6.interval		B	2.8	5.interval

		x_{ij}	Interval			x_{ij}	Interval
S5.5	A	2.5	4.interval	S6.6	A	2.8	5.interval
	B	2.3	4.interval		B	2.4	4.interval
S5.6	A	2.3	4.interval	S7.1	A	2.9	5.interval
	B	2.2	4.interval		B	2.3	4.interval
S6.1	A	2.5	4.interval	S7.2	A	3.1	5.interval
	B	2.7	5.interval		B	3.4	6.interval
S6.2	A	2.6	5.interval	S7.3	A	3.2	6.interval
	B	2.8	5.interval		B	3.1	5.interval
S6.3	A	2.8	5.interval	S7.4	A	2.7	5.interval
	B	2.7	5.interval		B	3	5.interval
S6.4	A	2.7	5.interval				
	B	2.9	5.interval				
S6.5	A	3	5.interval				
	B	3.2	6.interval				

Source: own

The classifications from Table 9 were used for creating two-dimensional Saaty matrices for both systems and for each sub-criterion separately. We proceeded Table 10 and results were overwritten into the Table 11.

Tab. 10: Process of the construction of Saaty matrices

If the values x_A and x_B are equal	1; 1
If the values x_A and x_B are unequal, but in the same interval	1/2; 2
If the values x_A and x_B are in adjacent intervals	1/3; 3
If the values x_A and x_B are in interval, among which is 1 different interval	1/4; 4
If the values x_A and x_B in intervals, among which is n intervals (maximum 6 intervals)	1/(n+3); n+3

Source: [27]

Tab. 11: Saaty matrices for both systems and sub-criteria

S1.1	A	B	Symbol	**Weights**
A	1	1	w_{11A}	0.5000
B	1	1	w_{11B}	0.5000

S1.2	A	B	Symbol	**Weights**
A	1	2	w_{12A}	0.6667
B	0.5	1	w_{12B}	0.3333

S1.3	A	B	Symbol	**Weights**
A	1	3	w_{13A}	0.7500
B	0.3333	1	w_{13B}	0.2500

S1.4	A	B	Symbol	**Weights**
A	1	0.3333	w_{14A}	0.2500
B	3	1	w_{14B}	0.7500

S1.5	A	B	Symbol	**Weights**
A	1	2	w_{15A}	0.6667
B	0.5	1	w_{15B}	0.3333

S2.1	A	B	Symbol	**Weights**
A	1	1	w_{21A}	0.5000
B	1	1	w_{21B}	0.5000

S2.2	A	B	Symbol	**Weights**
A	1	2	w_{22A}	0.6667
B	0.5	1	w_{22B}	0.3333

S2.3	A	B	Symbol	**Weights**
A	1	3	w_{23A}	0.7500
B	0.3333	1	w_{23B}	0.2500

S2.4	A	B	Symbol	**Weights**
A	1	3	w_{24A}	0.7500
B	0.3333	1	w_{24B}	0.2500

S3.1	A	B	Symbol	**Weights**
A	1	2	w_{31A}	0.6667
B	0.5	1	w_{31B}	0.3333

S3.2	A	B	Symbol	**Weights**
A	1	1	w_{32A}	0.5000
B	1	1	w_{32B}	0.5000

S3.3	A	B	Symbol	**Weights**
A	1	0.5	w_{33A}	0.3333
B	2	1	w_{33B}	0.6667

S3.4	A	B	Symbol	**Weights**
A	1	2	w_{34A}	0.6667
B	0.5	1	w_{34B}	0.3333

S4.1	A	B	Symbol	**Weights**
A	1	3	w_{41A}	0.7500
B	0.3333	1	w_{41B}	0.2500

S4.2	A	B	Symbol	**Weights**
A	1	2	w_{42A}	0.6667
B	0.5	1	w_{42B}	0.3333

S4.3	A	B	Symbol	**Weights**
A	1	3	w_{43A}	0.7500
B	0.3333	1	w_{43B}	0.2500

S4.4	A	B	Symbol	**Weights**
A	1	0.3333	w_{44A}	0.2500
B	3	1	w_{44B}	0.7500

S5.1	A	B	Symbol	**Weights**
A	1	3	w_{51A}	0.7500
B	0.3333	1	w_{51B}	0.2500

S5.2	A	B	Symbol	**Weights**
A	1	2	w_{52A}	0.6667
B	0.5	1	w_{52B}	0.3333

S5.3	A	B	Symbol	**Weights**
A	1	2	w_{53A}	0.6667
B	0.5	1	w_{53B}	0.3333

S5.4	A	B	Symbol	**Weights**
A	1	0.5	w_{54A}	0.3333
B	2	1	w_{54B}	0.6667

S5.5	A	B	Symbol	**Weights**
A	1	2	w_{55A}	0.6667
B	0.5	1	w_{55B}	0.3333

S5.6	A	B	Symbol	**Weights**
A	1	2	w_{56A}	0.6667
B	0.5	1	w_{56B}	0.3333

S6.1	A	B	Symbol	**Weights**
A	1	0.3333	w_{61A}	0.2500
B	3	1	w_{61B}	0.7500

S6.2	A	B	Symbol	**Weights**
A	1	0.5	w_{62A}	0.3333
B	2	1	w_{62B}	0.6667

S6.3	A	B	Symbol	**Weights**
A	1	2	w_{63A}	0.6667
B	0.5	1	w_{63B}	0.3333

S6.4	A	B	Symbol	**Weights**
A	1	0.5	w_{iiA}	0.3333
B	2	1	w_{iiB}	0.6667

S6.5	A	B	Symbol	**Weights**
A	1	0.3333	w_{65A}	0.2500
B	3	1	w_{65B}	0.7500

S6.6	A	B	Symbol	**Weights**
A	1	3	w_{66A}	0.7500
B	0.3333	1	w_{66B}	0.2500

S7.1	A	B	Symbol	**Weights**
A	1	3	w_{71A}	0.7500
B	0.3333	1	w_{71B}	0.2500

S7.2	A	B	Symbol	**Weights**
A	1	0.33	w_{72A}	0.2500
B	3	1	w_{72B}	0.7500

S7.3	A	B	Symbol	**Weights**
A	1	3	w_{73A}	0.7500
B	0.3333	1	w_{73B}	0.2500

S7.4	A	B	Symbol	**Weights**
A	1	0.5	w_{74A}	0.3333
B	2	1	w_{74B}	0.6667

Source: own

Final evaluation of the variant A is computed using the following relation:

$$X_A = \sum_{i=1}^{m} \left(w_i \cdot \sum_{j=1}^{n} w_{ij} \cdot w_{ijA} \right), \quad (8)$$

the variant B using the relation:

$$X_B = \sum_{i=1}^{m} \left(w_i \cdot \sum_{j=1}^{n} w_{ij} \cdot w_{ijB} \right), \quad (9)$$

where *m* is an index of a superior main criterion, *n* is an index of sub-criterion within a main criterion.

While w_i are weights of criteria from Table 5, w_{ij} are weights of sub-criteria from Table 6 and values w_{ijA} resp. w_{ijB} are weights of Saaty matrices from Table 11. Final values are shown in the Table 12.

In the prior evaluation we used a range, where the smallest value represented the worst alternative and the highest value represented the best alternative. Therefore, in the overall assessment we conclude that higher variant rating is, the better is given option to the compared variant. In both cases, alternative A was better than alternative B.

Tab. 12: Results of evaluation via standardized and non-standardized evaluation

Evaluation	Variant A (day surgery)	Variant B (traditional hospitalization health care)	Difference
Non-standardized	2.8158	2.8037	0.43%
Standardized	0.5927	0.4074	31.27%

Source: own

Based on the results from the application of AHP in comparison with functionality of health care systems we conclude higher efficiency of day surgery system. Day surgery is the area where we see a clear possibility of savings not only in the health care system, but also in national economic context. From an economic perspective, this area provides opportunities to reduce operating costs of hospitals and thus the required payments by the health insurance companies, but it also may have a positive impact on the area of health insurance, which would reflect in a more rapid re-engagement of the patient to the labor force. Mentioned analysis should be supported by the other complementary analyses, necessary for the development of day surgery in Slovakia. This is a call for an active participation of the Ministry of Health of the Slovak Republic, as well as the National Health Information Center, who are currently participating in our analyses of health care systems. The analysis can help to improve processes within the reporting system in Slovakia, as well as in decision-making processes in our healthcare system.

Conclusion

In the constantly proclaimed transformation of public health insurance system, identifying the gaps in the process of increasing efficiency and optimizing treatment and related economic processes in health facilities. The issue of day surgery is more in the center of attention from the reason of financing healthcare and it is a subject of constant negotiations at different levels of the health system in Slovakia. So far, the issue of deployment and use of day surgery in Slovakia, as one of the highly effective options to increase the financial savings in the health care system, has not been addressed comprehensively in Slovakia, but also in the V4 countries. Therefore it highlights the uniqueness of this issue, as well as the possibility of implementing knowledge to optimize medical processes and increases the efficiency of the health care system. If we want to implement the recommendations of reputable international institutions in Slovakia (e.g. OECD recommendation on reducing conventional hospital beds), it is necessary to support every State decision by the large-scale multi-dimensional analyses. Only such approach in the decision-making process will help to avoid reducing the

quality and accessibility of health care, consistently protect the consumers of health services and ultimately increase the prestige of the Slovak Republic for the more rationally behaving external environment. For achievement of all above stated, it is necessary to have a quality national and international registries that would provide all necessary information for the analyses of effective deployment and use of day surgery, comparable with foreign countries. International institutions such as the OECD, Eurostat, WHO declare also the significant methodological problems in the reporting of surgical procedures in each country and they encourage the cooperation to eliminate them [22]. Slovakia still records very low quotient of day surgery procedures of the total number of surgical procedures, while abroad is significant evidence of its progress. Our analysis confirmed the higher functionality of the day surgery system in comparison with traditional hospitalization health care. For a further complementary analysis of effectivity, not only focused on day surgery, it is necessary to access to the deeper and more structured data. It is required to increase an information discipline of health care providers, cooperation with national register and strengthen the legislative support (participation of Ministry of Health in SR). Without the analyzing of day surgery level of functionality, efficiency, specification of its determinants, detection of day surgery weaknesses and taking actions for their elimination, the future progress in setting up and using of day surgery is not possible.

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References

[1] BADS. *BADS directory of procedures* [online]. London: British Association of Day Surgery, c2009 [cit. 2012-07-08]. Available from: http://www.bads.co.uk.

[2] BARTÁK, M. *Ekonomika zdraví. Sociální, ekonomické a právní aspekty péče o zdraví.* 1. vyd. Praha: Wolters Kluver ČR, 2010. 224 p. ISBN 978-80-7357-503-8.

[3] BERGLAND, A., GISLASON, H., RAEDER, J. Fast-track surgery for bariatric laparoscopic gastric bypass with focus on anaesthesia and perioperative care. Experience with 500 cases. *Acta Anaesthesiologica Scandinavica.* 2008, Vol. 52, Iss. 10, pp. 1394-1399. ISSN 1399-6576.

[4] BUZINK, S., ŠOLTÉS, M., RADOŇAK, J., et al. Laparoscopic Surgical Skills Programme: Preliminary Evaluation of Grade I Level 1 Courses by Trainees. *Videosurgery and other Miniinvasive Techniques.* 2012, Vol. *7*, No. 3, pp. 188-192. ISSN 1895-4588.

[5] CASTORO, C., BERTINATO, L., BACCAGLINI, U., et al. *With the collaboration of IAAS Executive Committee Members.* Policy Brief. Day surgery: making it happen. WHO European Centre for Health Policy 2007.

[6] CORVERA, G., GESPEDES, B., YSUNZA, A. et. al. Ambulatory vs. in-patient stapedectomy: a randomized twenty-patient pilot study. *Otolaryngology – Head and Neck Surgery.* 1996, Vol. 114, No. 3, pp. 355-359. ISSN 0194-5998.

[7] CULLEN, K.A., HALL, M.J., GOLOSINSKIY, A. Ambulatory Surgery in the United States, 2006. *National health statistics reports*. 2009-01-28, no 11. Revised. Hyattsville, MD: National Center for Health Statistics. 2009. 28 p. Available also from: http://www.cdc.gov/nchs/data/nhsr/nhsr011.pdf.

[8] DEDIVITIS, R.A., PFUETZENREITER, E.G., CASTRO, M.A.F., DENARDIN, O.V.P. Analysis of safety of short-stay thyroid surgery. *Acta Otorhinolaryngologica Italica*. 2009, Vol. 29, No. 6, pp. 326-330. ISSN 0392-100X.

[9] DIRKSEN, C.D., SMITZ, R.F., HANS, K.M. et al. Ambulatory laparoscopic cholecystectomy is as effective as hospitalization and from a social perspective less expensive: a randomized study. *Nederlands tijdschrift voor geneeskunde*. 2001, Vol. 145, No. 50, pp. 2434-2439. ISSN 0028-2162.

[10] DLOUHÝ, M., BARTÁK, M. Mental Health Financing in Six Eastern European Countries. *E+M Ekonomie a Management*. 2013, Vol. 16, Iss. 4, pp. 4-13. ISSN 1212-3609.

[11] FEDOROWICZ, Z., LAWRENCE, D., GUTIERREZ, P. *Day care versus inpatient surgery for age-related cataract.* The Cochrane Database of Systematic Reviews, 2005. Art. No. CD004242.

[12] FLEISHER, L.A., PASTERNAK, L.R., HERBERT, R., ANDERSON, G.F. Inpatient hospital admission and death after outpatient surgery in elderly patients: importance of patient and system characteristics and location of care. *Archives of*

Surgery. 2004, Vol. 139, Iss. 1, pp. 67-72. ISSN 0004-0010.

[13] GAVUROVÁ, B., ŠOLTÉS, V. *Efektívnosť slovenského zdravotníctva – analýza komparačných aspektov a identifikácia rozvojových možností.* 1. vyd. Košice: TU, 2013. 116 p. ISBN 978-80-553-1451-8.

[14] GAVUROVÁ, B., ŠOLTÉS, V., KAFKOVÁ, K., ČERNÝ, Ľ. *Vybrané aspekty efektívnosti slovenského zdravotníctva. Jednodňová zdravotná starostlivosť a jej rozvoj v podmienkach Slovenskej republiky.* Košice: Technická univerzita, 2013. 275 p. ISBN 978-80-553-1438-9.

[15] GURUSAMY, K., JUNNARKAR, S., FAROUK, M., DAVIDSON, B.R. Meta-analysis of randomized controlled trials on the safety and effectiveness of day-case laparoscopic cholecystectomy. *British Journal of Surgery.* 2008, Vol. 95, Iss. 2, pp. 161-168. ISSN 1365-2168.

[16] HOFER, R.E., KAI, T., DECKER, P.A., WARNER, D.O. Obesity as a risk factor for unanticipated admissions after ambulatory surgery. *Mayo Clinic Proceedings.* 2008, Vol. 83, Iss. 8, pp. 908-916. ISSN 0025-6196.

[17] HOLLINGTON, P., TOOGOOD, G.J., PADBURY, R.T. A prospective randomized trial of day-stay only versus overnight-stay laparoscopic cholecystectomy. *Australian and New Zealand Journal of Surgery.* 1999, Vol. 69, Iss. 12, pp. 841-843. ISSN 0004-8682.

[18] IAAS. *Clinical indicators for ambulatory surgery* [online]. International Association for Ambulatory Surgery, 2003 [cit. 2010-05-15]. Available from: www.iaas-med.com.

[19] JANKE, F., PRÍDAVOK, M. B2B network performance: practical aspects of network supply adequacy indicator. In: DOUCEK, P., CHROUST, G., OŠKRDAL, V. (eds.). *IDIMT-2012: ICT Support for Complex Systems: 20th Interdisciplinary Information Management Talks: Sept. 12-14, 2012, Jindřichův Hradec, Česká republika*. Linz: Trauner Verlag, 2012. pp. 337-346. ISBN 978-3-99033-022-7.

[20] JANKE, F., PACKOVÁ, M. Impact of ICT investments on performance of companies in transitioneconomies: Evidence from Czech Republic, Hungary and Slovakia. *Quality Innovation Prosperity.* 2013, Vol. 17, No. 2, pp. 9-21. ISSN 1335-1745.

[21] JARRETT, P., STANISZEWSKI, A. The development of ambulatory surgery and future challenges. In: LEMOS, P., JARRETT, P., PHILIP, B. (eds.). *Day Surgery Development and Practice.* London: International Association for Ambulatory Surgery (IAAS) 2006, pp. 21-34. ISBN 978-989-20-0234-7.

[22] LAFORTUNE, G., BALESTAT, G., DURAND, A. *Comparing activities and performance of the hospital sector in Europe: how many surgical procedures performed as inpatient and day cases?* OECD Health Division, Directorate for Employment, Labour and Social Affairs, 2012. 80 p. Available also from: http://www.oecd.org/health/Comparing-activities-and-performance-of-the-hospital-sector-in-Europe_Inpatient-and-day-cases-surgical- procedures.pdf.

[23] MATTILA, K. *Day Surgery in Finland. Randomized and cross-sectional studies on treatment, quality, and outcome*. Doctoral dissertation. University of Helsinki, Faculty of Medicine, Institute of Clinical Medicine, Department of Anaesthesiology and Intensive Care Medicine. Helsinki, 2010. ISBN 978-952-92-7350-8.

[24] PAVLIKOVÁ, Ľ., SINIČÁKOVÁ, M. Labor Market Indicators and Their Causalities: the Case of the New European Union Member States. In *Procedia Economics and Finance: Emerging Markets Queries in Finance and Business: EMFB 2012: 24.27 October 2012*. Tîrgu-Mureş, România, Vol. 3, pp. 1229-1237. ISSN 2212-5671.

[25] RAMÍK, J. *Analytický hierarchický proces (AHP) a jeho využití v malém a středním podnikání.* Slezská univerzita v Opavě. Obchodně podnikatelská fakulta v Karviné, 2000. 217 s. ISBN 80-7248-088-X.

[26] SAATY, T.L., JOYCE, A.M. *Thinking with models.* 1st ed. Great Britain: Pergamon Press, 1981. 181 p. ISBN 0-08-026475-1.

[27] SAATY, T.L. *Multicriteria decision making - the analytic hierarchy process. Planning, priority setting, resource allocation*. 2nd ed. RWS Publ, 1990. 287 p. ISBN 978-0962031724.

[28] SAATY, T.L., KEAMS, K.P. *Analytical Planning.* 1st ed. Great Britain: Pergamon Press, 1985. 208 p. ISBN 0-08-032599-8.

[29] SEGERDAHL, M., WARREN-STOMBERG, M., RAWAL, N., BRATTWALL, M., JAKOBSSON, J. Clinical practice and routines for day surgery in Sweden: results from a nation-wide survey. *Acta Anaesthesiologica Scandinavica*. 2008, Vol. 52, Iss. 1, pp. 117-124. ISSN 1399-6576.

[30] SMITH, I., McWHINNIE, D., JACKSON, I. *Day Case Surgery.* British Association of Day Surgery. Oxford Specialist Handbooks, 2012. ISBN 978-0-19-958433-8.

[31] SZABO, Z.K., ŠOLTÉS, M., HERMAN, E. Innovative Capacity and Performance of Transition Economies: Comparative Study at the Level of Enterprises. *E+M Ekonomie a Management.* 2013, Vol. 16, Iss. 1, pp. 52-68. ISSN 1212-3609.
[32] ŠOLTÉS, M., PAŽINKA, P., RADOŇAK, J. Laparoskopická hernioplastika TAPP v liečbe slabinovej prietrže – 10-ročné skúsenosti. *Rozhledy v chirurgii*. 2010, Vol. 89, No. 6, pp. 384-389. ISSN 0035-9351.
[33] ŠOLTÉS, M., PAŽINKA, P., RADOŇAK, J. Termické lézie v laparoskopickej chirurgii. *Endoskopie*. 2011, Vol. 20, No. 1, pp. 14-16. ISSN 1211-1074.
[34] TOFTGAARD, C., PARMENTIER, G. International terminology in ambulatory surgery and its worldwide practice. In: LEMOS, P., JARRETT, P., PHILIP, B. (Eds.). *Day Surgery Development and Practice.* London: International Association for Ambulatory Surgery (IAAS) 2006, pp. 35-59. ISBN 978-989-20-0234-7.
[35] WASOWICZ-KEMPS, D.K. *Trends in day surgery in the Netherlands.Thesis, university of Utrecht, with summary in Dutch.* Enschede: Gildeprint B.V., 2008. ISBN 9789071382314.
[36] ZACHAR, D. *O plánovanej ďalšej redukcii lôžok v nemocniciach* [online]. Bratislava: INEKO, i-Health, c2013 [cit. 2013-07-08]. Available from: http://www.i-health.sk/1189_inekomentare-o-planovanej-dalsej-redu kcii-lozok-v-nemocniciach.
[37] ZACHAR, D. *O rozpočtovaných prostriedkoch pre zdravotníctvo v roku 2013 a o výške platieb štátu za svojich poistencov* [online]. Bratislava: INEKO, i-Health, c2013 [cit. 27.08.2013] Available from: http://www.i-health.sk/inekomentare/1201_o-rozpoctovanychprostriedkoch-pre-zdravotnictvo-v-roku-2013-a-o-vyske-platieb-statu-za-s vojich poistencov.
[38] ZÁVADSKÁ, Z., ZÁVADSKÝ, J., SIROTIAKOVÁ, M. Process model and its real application in the selected management areas. *E+M Ekonomie a Management.* 2013, Vol. 16, Iss. 1, pp. 113-127. ISSN 1212-3609.
[39] ŽIŽKA, M. Services in the Context of Entrepreneurial Environment of the Czech Republic. *E+M Ekonomie a Management.* 2012, Vol. 15, Iss. 4, pp. 97-109. ISSN 1212-3609.

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Abstract

THE FUNCTIONALITY COMPARISON OF THE HEALTH CARE SYSTEMS BY THE ANALYTICAL HIERARCHY PROCESS METHOD

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Day surgery is one of the areas that are still not implemented in Slovakia in the intentions of finding significant economic savings in the health care system. The primary objective to use day surgery was to separate the patients with lighter chirurgical procedure, to less traumatize the patients with hospitalization, to protect the patient from nosocomial infections and to make recovery easier in greater comfort of the own home. The primary impulse for dealing with the effectiveness of health care systems, with an emphasis on day surgery, were conflicting responses regarding the efficiency and effectiveness of deployment and use of day surgery performance. On the one hand, we find the direct and indirect evidence of functional application of day surgery performance in health facilities in Slovakia and its potential benefits in achieving the aims of health policy of the SR. On the other hand there are critical responses on lack of the effects of the day surgery use, which are associated with low valuation of stated procedures which are inadequate to the real costs. It hinders its development in comparison with the development abroad. The main aim of this article is to compare the functionality of day surgery care in comparison with the system orientated on traditional hospitalization, using the opinion of the experts who represent the system of health care in Slovakia. For orientation in criteria characterizing the functionality of health care systems in Slovakia, we started from the premise that the functionality of health care system is a basis of its effectiveness. Given the considerable heterogeneity of compared criteria of health care systems we have chosen the method of Analytical Hierarchy Process as the optimal method, supported by the expert group method.

Key Words: *Health care system, in-hospital care, day surgery, Analytical Hierarchy Process, functionality of day surgery.*

JEL Classification: *I11, I12, I14, I18, I19.*

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SCENARIOS AND THEIR APPLICATION IN STRATEGIC PLANNING

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Introduction

The impetus for the origin and development of scenarios or scenario thinking were failures of many strategic decisions based on one projection of the future, specifically on values of fundamental factors which influence consequences of these decisions. A great deal of attention has been paid to scenarios since the 70s of the past century. The company Shell was a pioneer of the scenario approach in the strategic decision-making process. Heiden [17] points out that since the 80s of the past century Shell has insisted on the evaluation of every important project against the set of scenarios elaborated. Since then scenarios have become an important tool of creative thinking development when considering possibilities of the future development. Similarly, scenarios became an important tool of decision support, especially of strategic nature. Over the past years scenarios were applied stepwise even in the Czech Republic. Contemporary methods of scenarios construction work on need to ensure flexibility of the strategic plan and get the firm ready for a quick reaction when setting trigger points specifying the corresponding scenario which come to pass. Processing business environment information, known as Business Intelligence, becomes necessity. Strategic scenarios contain approaches of strategic planning, risk management and managerial decision. At the same time demands on the CEO staff grow. Apart from experience and intuition relevant knowledge foundation and work with information sources creates important managerial competences. The goal of this article is to describe the scenario formation methodology in strategic planning processes and to discuss their possible impact on meeting company's strategic goals. Finally, the impacts of risks on strategic planning processes are exemplified by a business case.

1. Scenario Concept

The concept of scenarios is not uniform. The existing differences are usually reflections of the use of decision aspects in scenarios, which are applied to a different extent. It deals with mixing possibilities of external environment development which is not usually influenceable or partly influenceable by the decision-making subject on the one hand and an intentional selection of a certain action variant by this subject on the other hand.

The former concept is prevalent in professional literature. According to Gugan [15], scenarios provide alternative views of the future. They identify some fundamental events, key players and their motivation and offer different perspectives of the future world development. The development and application of scenarios are thus conducive to searching for ways how to challenge future uncertainties. According to Schoemaker [29], scenarios represent internally consistent pictures of the future which are based on a certain group of mutually interlinked factors of both a qualitative and quantitative nature. As per Schoemaker, the starting point of their formation should be specification of what we know about the future development, such as trends, on the one hand and specification of what we do not know, such as key uncertainties, on the other hand. Every scenario is then based on interconnection of these trends and uncertainties. An analogical concept is held by Foster [7]. According to him, scenarios represent a certain picture of the future which combines **qualitative** and **quantitative characteristics**. According to Pearson and Lyons [26], the scenario formation

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comes out of factors which are both uncertain and have a key impact on the system. As per Tessun and Hermann [30], scenarios identify the key driving forces of the development including their mutual dependences which are further tied with existing opportunities and risks. Van der Heijden [18] supports and adheres to the same concept of scenarios. Scenarios, as opposed to usual prediction methods, are focused on the identification of discontinuities in the development and help the organization cope with sudden changes and noticeably contribute to its survival. They enable not only a better understanding of the possible vulnerability of a company, but they are also conducive to its optimum strategic orientation.

2. Development of Scenarios for the Support of Strategic Planning

The incentive to working with scenarios is the formulation of company vision. Strategic management vision is understood to be an exact and structured expression of company status in a defined future time horizon. Since the strategy represents a basic planning document, it must be formulated both exactly and consistently in all partial components in order not to lose meaning in its entirety. The planning horizon is usually mid-term but this determination is contingent both upon the character of the business (e.g. pharmaceutical industry, energy industry or capital construction have longer planning horizons) and the development of economic cycle which influences the relevancy of predictions. Even if vision contains all initial information, yet it has to have necessary breadth and depth to become a tool for **long-term strategic goals determination.** While adhering to these goals and respecting the vision content, **strategic grounds** are consequently deduced. These grounds describe the requested shift of the company towards target position defined on the basis of all available and known information including demands and attitudes of key stakeholders. It is conditional for the success of scenario elaboration that all important stakeholders concerned would not have objections to scenarios content and their application.

The very process of scenario elaboration can be split into six basic steps:

- Identification of risk factors and determination of their importance.
- Selection of key risks which, according to the company's opinion, fundamentally influence fulfilment of strategic goals.
- Formulation of basic scenarios and testing their consistency.
- Determination of probability of scenarios occurrence.
- Performing a "gap analysis" for the sake of determining the extent of strategic goals fulfilment.

2.1 Identification of Risk Factors and Determination of Their Importance

Identification of risks is a process upon which factors that can influence strategic grounds negatively or positively are determined. (It is important to emphasize that we do not understand risks only as the negative ones – threats, but also the positive ones – opportunities).

Quality and reliability of scenarios composed depend on the quality and extent of information collected and processed. **Business Intelligence** represents a complex method which is aimed at obtaining and analysing supportive information about the business environment in its entirety. The nature of this method is processing and analysing publicly available and verified data, which include government information and documents, web sites, business presentations, advertisements, interviews, surveys, financial reports, business meetings, exhibitions, company managers' and speakers' statements (competitors, suppliers, distributors, customers etc.) [13].

In order to apply the Business Intelligence concept, variety of methodological approaches and tools of data collection and analysis techniques, such as SWOT, competitors' profile, benchmarking, environment development modelling, sectorial, financial and Win/Loss analyses, are used. It typically deals with retrospective analyses which are performed mostly after important capital transactions either between various business subjects or state and these subjects. The objective of these analyses is to find out whether these transactions were successful or not and why [14].

In view of the numerous risks to be usually identified there is necessity to restrict them to several **key risks** which play the role in scenario development. Furthermore it is necessary to judge the significance of these risks. **Risk**

assessment matrix or sensitivity analysis (supposing that risks are quantifiable) may be used as supportive tools. [12].

Risk assessment matrix is a tool of an expert evaluation of risk importance which is based on two aspects. The first one is the risk occurrence probability and the second one is the strength of its impact on the firm (usually in a form of chosen financial indicator, which can be profit, cash flow etc.). The outcome of risk assessment matrix is the list of **key risks** that are characterized by both high probability of occurrence and high importance of the impact.

The nature of **sensitivity analysis** is testing impacts of equal relative deviations (e.g. 10%) of risk factors (sales, selling price, raw material purchase prices, energy prices, exchange rates) from their most probable values on the company's key performance criteria (profit, EVA, ROI etc.). The outcome of the analysis is then the identification of factors to which the selected criterion of strategic plan evaluation is **highly sensitive.** These factors then widen the set of key risks.

Finally, it is necessary to point out that risks may create a **causal chain.** At the one end of this chain there are **sources (causes) of the risk** or risks which are close to this source, while at the other end there are risks which are close to their impacts. For example, the war conflict in the Near East can be close to causes of the increase in prices of crude oil. The increase in crude oil prices results in the gasoline price increase as well as in the price increase of other crude oil products, which are regarded as raw materials for the petrochemical industry. The increase in gasoline price implies the increase in transportation companies' service prices (or the decrease in their profit supposing that they fail to increase the service prices). These service prices then have an impact on transportation costs of companies which consume these services etc. When elaborating scenarios for strategic planning of the respective subject, e.g. an industrial company, it is necessary to work with such risks that are in such a position of the causal chain where they can be transferred relatively easily to financial plans. For these risks it is also possible to determine a probability distribution. As far as transportation companies are concerned, such factors might be the crude oil price and the exchange rate of USD/CZK, since USD is a currency in which crude oil prices are purchased.

2.2 Formation of Representative Scenarios and Testing Their Consistency

Scenario formation comes out of **key risks.** The number of these factors must be restricted so that too many scenarios could not come into existence. Excessive number of scenarios would hamper their application. The simplest case is the existence of the two most important binary risks, which implies four possible scenarios. To describe scenarios consisting of two risks a **scenario matrix** with an advantage is used. This matrix enables us to make an analysis of the interaction among key risks. It is commonplace that one of the scenarios represents the most probable development of environment. This scenario is usually designated as a **basic scenario.** The remaining scenarios explicate other possible, but as a rule, less probable alternatives of the future development.

It is possible to arrive at the same results by means of **probability trees** [11], or **event trees** [5], which are, however, suitable in a situation where more risks exist or these risks exert their effects gradually. It is worth mentioning that the probability or event trees deal with **discreet risks.** In case of **continuous risks** it is inevitable to approximate their continuous distribution curve by the stepwise one [11] and consequently work with several values of these factors which represent a single continuous risk. The advantage of the use of probability trees in scenario planning consists in the tree construction simplicity, its transparency, comprehensibility and the depiction of conditional development of risks. The undisputable benefit is that there is no need to foresee the end of the event and by means of this technique it is possible to identify weaknesses of the system. The disadvantage, which is usually attributed to the use of probability and event trees, is their discreet character and low number of risks, which can be subjected to analysis, since the tree has to remain illustrative.

In practice analysts usually work with a few scenarios that represent certain real and possible developments of key risks. In company strategic planning the following scenarios are usually applied:

- **Optimistic scenario,** where other existing opportunities utilized by the internal potential of the company are taken into consideration. The optimistic development offers assumption that goals which have been set down will be exceeded.
- **Basic (the most probable) scenario** is based on the most probable development of key risks.
- **Pessimistic scenario,** where circumstances and trends resulting from threats identified are taken into account. The company cannot usually cope with these threats by its internal potential and consequently it is supposed that goals determined will not be fulfilled.

In crisis management an extremely unfavourable development which results in **warning and alert scenarios,** which are based on the highly pessimistic development of respective risk components, is taken into consideration.

Scenario testing represents the process of examination of their consistency, which means the rationality of assumptions chosen as well as the viability of scenarios. Scenarios are subjected to critical logical analysis with the aim to judge their meaning within the group of their authors. Besides logical analysis, even intuitive approaches are not excluded from the testing process. As long as the scenario proves not to be inherently consistent, it is necessary to answer the question: "What is the cause of it?" The usual problem is that one or more assumptions prove to be unrealistic. In such a case it is necessary to revert to the very beginning and redefine assumptions and by means of the iterative process to arrive at a stage when scenarios elaborated are sufficiently consistent.

2.3 Scenario Probability Determination

In case of relatively simple scenarios it is possible to determine their probabilities. When applying probability trees to scenarios depiction, it is necessary, especially in view of the frequent dependency of individual risks, first of all, to determine the unconditional probability distribution of risks, which is portrayed by the chance node positioned on the far left side of the tree. It is the root of the tree. Furthermore, the conditional probability distribution of risks portrayed by nodes situated on the right side of the tree root has been determined stepwise. This process is continued until we arrive at risks portrayed by the node which is situated on the far right side of the tree. The probability of each scenario is then calculated as multiplication of risk probability values which are situated on the same branch of the probability tree. (We encounter an analogical situation in the scenario matrix application which can easily be transformed into a simple probability tree).

Probabilities of risks do not usually have the character of objective probabilities determined on the basis of historical data by means of statistical methods. It deals prevalently with subjective probabilities, which are based on experience, intuition and information background of these experts [6].

2.4 Performing a "Gap Analysis" to Evaluate the Scope of Fulfilment of Strategic Goals Formulated

The scenarios discussed were composed on the basis of key risks and probabilities which may come into effect. Now it is necessary to examine the performance efficiency of strategic plan variants in individual scenarios and compare them with the originally formulated strategic grounds. This process is called a "gap method" and its essence is the identification of the so-called **Planning Gaps.** A **Strategic Gap** then represents the difference between the strategic goals planned and the development of the variant in the respective scenario. The incentive to performing a Gap Analysis is the examination of the need for a strategic action also in the stage when the strategic plan variant is still correctable. This approach is more effective than performing non-conceptual changes at the level of operational management. A continuous assessment of the fulfilment of key performance indicators during the strategy implementation is a basic requirement for the effective execution of the strategic control which is closely combined with the scenario approach. Moreover, an effective transformation of a strategy into a fundamental strategic plan as well as the observation of risk development and the possibility of assessing the risk impact on the strategy are also prerequisites for a successful gap analysis.

3. Application of Scenarios for the Support of Strategic Planning in Practice

The most important area of scenarios application in a business company is **strategic planning and decision making.** Scenarios can be conducive to:

- elaboration of strategic plan variants (hereinafter referred to as "strategic variants"),
- assessment of strategic variants,
- risk management.

The application of scenarios as a tool for the support of **strategic variants formulation** comes out of the assumption that scenarios illustrate different possibilities of the external environment development and provide thus incentives to the consideration of possible fundamental ways of reaction to a different development of this environment. This prerequisite then supports the formulation of some strategic variants. These variants are not merely quantitative modifications of one strategic variant, but they differ substantially by their nature.

Scenarios play an important role in the **evaluation of strategic variants** and their **risk assessment** [25]. The fundamental assumption is that **each variant** should be tested at **all scenarios.** It means that for each strategic variant and each scenario the impacts with regard to the individual criteria assessment should be determined. The financial plan elaboration for each variant and scenario shall be considered as a basis for the determination of these impacts, which are usually expressed by means of the key financial criteria. Values of these and other criteria, which account for possible results of individual variants in all scenarios, then enable us to judge **risk size** of individual variants and **acceptability of such a risk.**

For this purpose the following techniques can be used:

- **Scope of possible results** of strategic variants with respect to individual criteria. The wider these intervals are, the higher risk is recorded. A relatively narrow scope of values points out that the results gained in all scenarios are not significantly different. It indicates that the strategic variant in question is considerably robust (as a matter of fact it deals with the variant for general application).
- **Strategic variant results** obtained in a **pessimistic or warning** scenario. It deals preferably with the assessment of **financial stability** (commercial viability) of variants which rests on the examination of the company's ability to repay its liabilities used for the financing of the respective strategic variant in the considerably unfavourable development of business environment. In case of known scenario probabilities, **numeric risk characteristics** of strategic variants with respect to quantitative criteria, such as the variance, the standard deviation or the coefficient of variation may be used.

The decision about acceptance or refusal of certain strategic variants would be simple providing that the variants in question are economically effective with the acceptable risk exposure even in a pessimistic scenario and vice versa – economically ineffective in an optimistic scenario. It is obvious that this situation is very rare in business practice. Another situation which is also very rare is that a certain strategic variant arrives at the best results in all scenarios. Such being the case, then a **dominating variant** exists. As long as this is not the case, the selection of a strategic variant based on the aforementioned information about the risk size depends, to some extent, on managers' or company's attitudes to risk.

In **strategic risk management** both a timely preparation of provisions aimed at minimizing the negative impacts of business environment development, which is in consonance with the pessimistic or warning scenario, and a preparation of provisions that enable us to take the opportunity and to reinforce the positive impacts of the development to be in agreement with the optimistic scenario are important. To examine whether the business environment development proceeds in accordance with a certain scenario, **early warning systems** are used. For each factor included in a scenario, certain **limit (signal) values** should be determined. These values become indicators of the environment development showing conformity of this development with the particular scenario. When the actual development deviates from signal values, then it is necessary to repeatedly analyse the environment development and correct or update the set of scenarios formulated. Early warning systems should also draw attention to substantial changes in other

factors which have not been included in the scenario formulation so far and in this way to initiate their possible integration into scenarios.

4. Case Study on the Scenario Application in the Elaboration of the Strategic Plan of a Particular Company

4.1 Company Vision and Mission

The scenario approach was verified in practice by means of the elaboration of the strategic plan of a mid-sized machinery company which is active in the machine tool segment. The objective of practical verification of the scenario application was:

- elaboration of the set of three scenarios,
- evaluation of the initial variant of strategic plan in these scenarios,
- application of strategic management tools.

The company's vision for 2015 was formulated as follows:

"Our machinery company wants to continue providing customers with high quality products which are of in-house development as per their requirements. Our company wants to invest into innovation (rationalisation) over the next three years, which enables the increase in product prices by means of product quality improvement and consequently the increase in company sales.

Besides the Czech market, the company wants to draw attention to foreign markets where our company will strive for strengthening its position in the Russian market as well as for entering new markets in other countries of the former Soviet Union, where the contacts have already been established. At the end of the planned period the company wants to close a contract for the supply of one machine per year to the Ukraine, Belorussia and Kazakhstan. In the sphere of human resources the working team is stabilised as far as their technical and qualification skills are concerned. Therefore, the emphasis is placed on the employee motivation and education, especially in the sphere of language skills. The company will reinforce its goodwill and reputation and will continuously present itself at four world fairs a year."

The strategic plan for the three-year planning horizon covering the period of 2013–2015 came out of these **mid-term strategic goals that have been determined as follows:**

- By the end of planned period to invest into innovation and upgrading of current technological facilities. Capital expenditure should not exceed CZK 38M.
- By means of quality improvement and a new portal centre, company sales will rise at least by 30%. Strengthening of our position in the Russian market by means of establishing a **service centre,** which should generate not only a competitive advantage, but also time and costs savings. Respective costs should not exceed CZK 2M.
- Closing a contract for the construction of one machine per year for the Ukrainian, Belorussian and Kazakh markets.
- Achieving the return on **sales indicator value** (ROS=EBT/sales) **above 5%.**
- Retaining the **above-standard** remuneration for key employees as compared to competitors.

4.2 Identifying Risks and Determining Their Significance

The analysis of business environment resulted in the identification of risks mentioned in Tab. 1. These risks are ranked according to the fact whether they are negative ones (threats) or positive ones (opportunities). The first seven factors account for threats, while the last three factors represent opportunities. Tab. 1 shows the evaluation of the importance of each factor which is determined as a multiplication of expert assessment of probability of its occurrence and the importance of impact on the company. (In both cases the scale 1–5 was used, where level 1 corresponds to the lowest probability or the lowest importance, while level 5 corresponds to the highest probability or the highest importance of the impact). As a borderline, which separates less important risks from more important ones, evaluation 10 was chosen. Risks that were evaluated higher than 10 represent key risks which are manifested as threats and opportunities.

Tab. 1: Evaluation of the importance of risks identified

Risk factor	Probability of occurrence	Severity of impact	Total value	Key risks
Failure of technological equipment	2	4	8	NO
Increase in minimum wages	4	3	12	YES
Decrease in production quality	3	2	6	NO
Increase in sub-supplies prices	3	4	12	YES
Availability of innovation sources	2	1	2	NO
A great deal of competitors entering foreign markets	4	3	12	YES
Saturation of demand for machines in the Czech market	4	4	16	YES
Legislation changes with the impact on energy prices	5	3	15	YES
Increase in government investments for the development of technologies in Russia, Belorussia and the Ukraine	4	4	16	YES
Increasing demand for machines in Kazakhstan	3	2	6	NO
No local competitors in the Russian market	3	2	6	NO

Source: own

Tab. 1 shows that six risks out of eleven represent key risks with the prevalence of negative risks. These negative risks (ranked as per their importance) include saturation of the demand for machines in the Czech market, legislation changes with the impact on energy prices, the increase in minimum wages, the increase in subcontract prices and a great deal of competing companies entering foreign markets.

Saturation of demand for machines in the Czech market

The company made a point of fulfilling production capacity every year and closing eight contracts for the production of new portal centre at least. The company sees as a reality closing 2–3 contracts in the Czech market and, therefore, it would have to close 5–6 contracts in foreign markets. In view of the possible saturation of the demand for machines in the Czech market, a situation when the company does not close the requested number of contracts and does not fulfil its production capacity may occur. Such a situation leads to the decrease in sales of own products and services. Low sales have a negative impact on the company's profits.

Legislation changes affecting energy prices

In accordance with the increasing production the energy costs are also rising and, therefore, the increase in energy costs has a negative impact on the company. In accordance with the five-year price prospect of electric power in the Czech Republic the company expects a relatively moderate rise in electric energy by approx. 8% in the planned period. There are, however, significant risks of possible legislation adjustments, such as the extent of the state subsidy for renewable energy sources and the consequent impact on prices regulated by the Energy Regulatory Office.

Increase in minimum wages

The human capital represents a crucial internal factor for the company, since they acquired important know-how. A possible loss of key employees would create a huge problem for the company. Employees' assessment is also linked with the maximum utilization of human capital. The company has to secure wages to be permanently above the average and also competitors' ones, so that the company's stability in the planned period would also be secured. Along with the increase in minimum wages a permanent rise in other employees' wages should be expected.

Increase in subcontract prices

In the long run the company has established a selected supplier network from whom it purchases material and component parts on a contractual

basis. Material prices are fixed in advance with regard to supply volumes demanded. The advantage is possible volume discounts when purchasing higher quantities. On the other hand, there is a danger of a supply price increase when the production capacity is not fully utilized and a lower volume is purchased. This inevitably implies a negative impact on costs and material consumption.

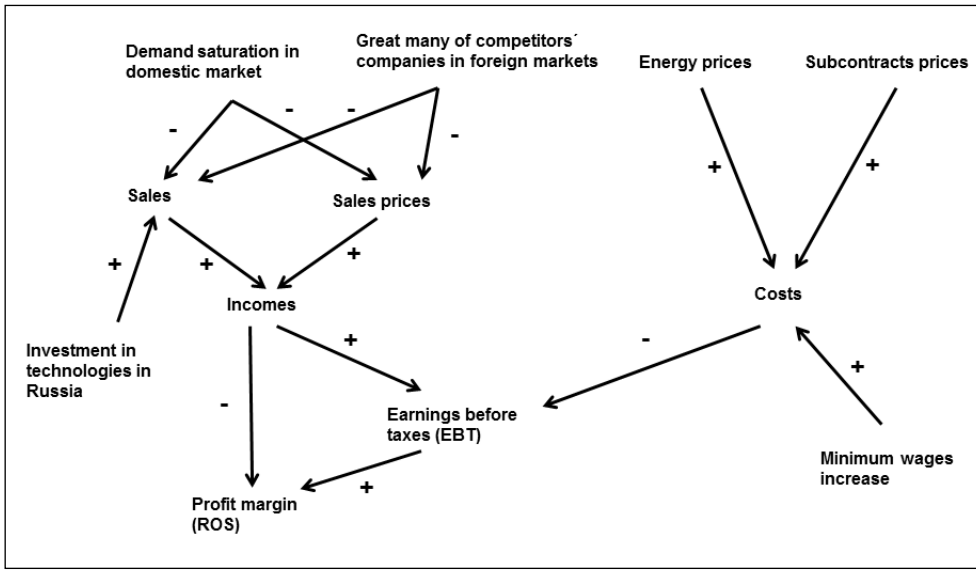
A great deal of competing companies entering foreign markets

The portal centre market is highly competitive, especially due to the German companies operating in this segment. In case the company fails to challenge competitors and does not close the requested number of contracts to utilize its production capacity, the decline in sales and profit will be recorded.

The only important opportunity is represented by the increase in government investments for the development in countries of Russia, Belorussia and the Ukraine. In the next three years the company plans to focus more intensively on the Russian market, where it wants to grab at least four contracts per year for the production of a new portal centre. At the same time the company plans to enter new markets of the former Soviet Union countries, such as Belorussia, the Ukraine and Kazakhstan, for which the company has set a goal to close one contract per year. One of the favourable risks is the government investments in the technology development in Russia, Belorussia and the Ukraine which are expected to rise in the reporting period. The investments can increase demand for machines and consequently increase the sales and profits.

The above-mentioned key risks influence the sales volumes, selling prices and costs. This is reflected in the company's revenues and profits with the impact on financial indicator values. The mutual links of these factors illustrated by a cognitive map are shown in Fig. 1 (A plus sign in the connecting line depicting the dependency of these factors means that the increase in the factor from which the connecting line comes out causes a growth of the factor to which the connecting line is directed. A minus sign means an inverse relationship where e.g. the increase in demand saturation in the domestic market results in the decrease in sales and selling prices.

Fig. 1: Cognitive map



Source: own

The results of sensitivity analysis of the company's profit in 2013 support the importance of the identification of key risks or opportunities. Negative changes at the same 10% in individual costs and revenues items from their planned values are shown in Tab. 2.

Tab. 2: Results of the sensitivity analysis of the company's profit after tax

	Planned value [thous. CZK]	Change by 10% [thous. CZK]	EBT [thous. CZK]	Absolute change in EBT [thous. CZK]	Relative change in EBT [%]
Sales of own manufactured products and services	215,000	193,500	-15,717	-21,500	-371.77
Material consumed in production	109,564	120,520	-5,173	-10,956	-189.46
Energies consumed in production	30,186	3,305	2,764	-3,019	-52.20
Services	27,870	3,057	2,996	-2,787	-48.19
Personnel costs	36,188	3,907	2,164	-3,619	-62.58
Taxes and charges	47	52	5,778	-5	-0.08
Depreciation of fixed assets (tangibles & intangibles)	6,508	7,159	5,132	-651	-11.25
Income from sales of fixed assets and materials sold	5,000	4,500	5,283	-500	-8.65
Other operating earnings	1,441	1,296	5,639	-144	-2.49
Other operating costs	1,257	1,483	5,557	-226	-3.90
Interest expenses	1,985	3,184	5,585	-199	-3.43
Other financial income	1,313	1,182	5,652	-131	-2.27
Other financial costs	1,365	1,602	5,547	-237	-4.09
Earnings before taxes (EBT)	5,783				

Source: own

The above-mentioned table shows that the highest decline in the company's Earnings Before Taxes – EBT (by 372%) caused a drop in sales of own manufactured products and services.

The change can be provoked either by the decrease in the selling price contracted for, which has been planned at the average value of CZK 20M. per contract and the considered 10% decrease would have an impact on EBT in the amount of CZK 18M or by the decrease in the production volume planned in such a way that one single contract that is not executed results in the absolute decrease in EBT by CZK 20M. It is clear that both risks will bring about the same impact on the sales. The increase in material consumption by the same percentage also has an important impact (189%). The incidental rise in personnel costs or energy consumption should not be neglected either. A relative change in EBT by more than 50% is considered significant.

4.3 Scenario Formation and Their Impact on the Company's Financial Plans

4.3.1 Scenario Formation

Scenario formation comes out of the predicted development of risks identified. By their interaction it is possible to arrive at the basic, pessimistic and optimistic scenarios. The development of key risks to be supposed is illustrated in Tab. 3.

The scenario formation comes out of the assumption that the year 2013 is fixed from the contractual point of view and the risks will have an impact on the company as late as in 2014 and 2015. In the year 2013 contracts for nine big machines were closed, which will generate sales of CZK 172M. 80% out of the total sales are attributed to the sales of own products and services, while the remaining 20% refer to the incomes for overhauls and cooperative machine tool operations which account for CZK 43M. The average product price is CZK 19.4M.

Tab. 3: Development of key risk factors in scenario considered

	Basic scenario	Basic scenario	Basic scenario		Pessimistic scenario		Optimistic scenario	
	2012	2013	2014	2015	2014	2015	2014	2015
Production volume [pieces]	7	9	8	8	7	7	10	10
Average product price contracted [M CZK]	17.0	19.4	21.4	23.5	18.4	19.9	21.4	23.5
Overhaul revenues [M CZK]	51.0	43.0	48.0	51.0	37.5	47.0	53.3	58.7
Material consumption [M CZK]	110.5	109.5	120.9	130.5	87.9	116.0	130.1	140.5
Energy prices [CZK/Mwah]	1,250	1,350	1,404	1,460	1,437	1,531	1,404	1,460
Energy costs [M CZK]	30.8	30.2	30.0	32.5	24.2	30.5	35.8	39.38
Services [M CZK]	26.5	27.9	29.2	30.7	28.0	35.2	32.1	33.8
Average employee salary [thous. CZK]	30.5	33.5	36.8	40.5	36.8	40.5	36.8	40.5

Source: own

As for the incomes, scenarios can be characterized as follows: **the basic scenario** assumes the sales of eight big machines and a price increase by 10% in each year of the 2014–2015 period compared to 2013. The main reason for the increase in sales rests on the improved quality of products, which was accomplished thanks to innovations of the current technological facilities. The average machine price was CZK 21,340,000 and CZK 23,474,000 in the years 2014 and 2015 respectively. The incomes for overhauls show the increase thanks to the opening the service centre in Russia.

As opposed to **the basic scenario,** the pessimistic scenario assumes that saturation of demand for machines in the Czech market will result both in closing fewer contracts and fixing prices which are lower than those assumed in the basic scenario due to the competitors' pressure. The pessimistic scenario assumes closing one contract only in the Czech market and on the whole seven contracts are predicted to be closed in each contractual year (2014 and 2015). An average contracted price decline can be 5% in the year 2014. In 2015 it is assumed that due to the competitors' pressure the machine price will drop by 15% as compared to the basic scenario. Incomes from overhauls are developing in proportion to the decrease in service demand.

In **the optimistic scenario** the company assumes that the impact of machine demand saturation in the Czech market will not influence negatively its sales. The increase in government investments in the technology development in Russia, Belorussia and the Ukraine will positively influence the number of contracts closed in these countries. The assumption of the optimistic scenario is that notwithstanding the strong competition in the foreign market, the production capacity will be fully utilized in each year, which accounts for closing ten contracts in each year of 2014 and 2015 at the price increased by 10% thanks to the improved product quality (which refers to the basic scenario). In view of the increased product quality, the increase in the average machine price by 10% is assumed in either year, which represents one of the company's goals. The overhauls income development is positively affected by the operation of the service centre in Russia.

In terms of the costs the scenarios can be characterized as follows: The company purchases material continuously from the approved suppliers depending on the contracts closed. As long as the company fixes a certain

purchase volume, the supplier offers a volume discount of 3%. The energy consumption is partially invariable (approx. 3%), which the company has to cover even in case of no or low production. Yet a prevalent part of the costs is variable and dependent on the production volume. The **basic scenario** assumes that the energy price will be CZK 1,350/Mwah in 2013 and it will rise by 4% in the years 2014 and 2015, which will result in the increase in energy costs. The increase in services is assumed to be 5% per year. The development of unfavourable risk factors in the **pessimistic scenario** will have an impact on the **material** and **energy consumption** as well. As long as the company purchases a lower quantity of material due to the lower number of contracts closed, the company is not allowed to get a discount and by contrast the material unit price will rise. The increase in the material unit price is supposed to be at the level of volume discount (3%). Last but not least, a moderate decline in the costs will not be adequate to the steep decline in sales. The increase in energy prices in this scenario is higher than that in the basic one and it is supposed to be 6.5% in each year of the planned period.

The **optimistic scenario** reckons on the positive impact of risks on the Material, energy and services consumption. In view of maximizing the machine production output it is necessary to reinforce outsourcing so that the company can meet product delivery timelines. As opposed to the basic scenarios the service costs will rise (which accounts for 15% of the Material, energy and services consumption in the basic scenario) by 10% in each year of the period. Simultaneously, energy costs will also rise by 10% each year. As far as energy prices are concerned, the same development as that indicated in the basic scenario is supposed. Material costs will also increase due to bigger volumes consumed while the prices to be charged for material remaining the same as those stated in the basic scenario. The determination of personnel costs comes out of the assumption that the headcount in all scenarios in both planned period is identical, specifically 67. Similarly the growth of the average monthly salary of CZK 33,500 in 2013 by 10% per year for each scenario is assumed.

4.3.2 The Impact of Scenarios on Both the Company's Financial Plan and Key Indicator ROS

A different development as per individual scenarios has an impact on the company's financial plan. The development of chosen financial plan items in these scenarios is shown in Tab. 4.

Tab. 4: Development of basic financial plan items in scenarios considered [CZK in M]

	Basic scenario	Basic scenario	Basic scenario		Pessimistic scenario		Optimistic scenario	
	2012	2013	2014	2015	2014	2015	2014	2015
Sales of own manufactured products and services [M CZK]	169.9	215.0	236.5	260.1	186.7	234.7	266.7	293.5
Material, energy and services consumption [M CZK]	141.3	167.6	180.1	193.7	140.0	176.0	198.2	213.1
Personnel costs [M CZK]	31.4	36.1	39.7	43.7	39.7	43.7	39.7	43.7
EBIT[M CZK]	9.7	8.8	13.5	16.9	3.9	3.7	25.7	30.8
Financial profit [M CZK]	-2.1	-3.0	-2.9	-3.3	-2.9	-3.3	-2.9	-3.3
After-tax profit (EAT)	6.6	4.9	9.1	11.7	0.8	0.3	19.7	23.7
Pre-tax profit (EBT) [M CZK]	7.5	5.8	10.6	13.6	1.0	0.4	22.9	27.5

Source: own

Differences in the financial plan items are manifested in Return on sales indicator values (ROS), which were calculated for each year of the planned period considered. ROS was chosen as a metric for the measurement of the extent of fulfilling the company's basic strategic goal. The development of this indicator is shown in Tab. 5.

Tab. 5: Comparison of Return on sales (ROS) development as per individual scenarios

	Basic scenario	Basic scenario	Basic scenario		Pessimistic scenario		Optimistic scenario	
	2012	2013	2014	2015	2014	2015	2014	2015
EBT [M CZK]	7.5	5.8	10.6	13.6	1.0	0.4	22.9	27.5
Sales of own manufactured products and services [M CZK]	169.9	215.0	236.5	260.1	186.7	234.7	266.7	293.5
ROS [%]	4.42	2.70	4.48	5.22	0.54	0.14	8.56	9.37

Source: own

Even if the company generates a positive profit in each year according to the pessimistic scenario, EBT, as contrasted to the basic scenario, will drop by 90.35% and 97.57% in 2014 and 2015 respectively. It is reflected by a significant drop in Return on sales. This development indicates that the company should examine other variants of the strategic plan as well, e.g. a restriction on investment activities. It is also possible to correct strategic goals, for instance to postpone the establishment of the service centre in Russia.

According to the optimistic scenario, the increase in profit by 115.37% and 102.43% in 2014 and 2015 respectively, as contrasted to the basic scenario, will be recorded. Return on sales (ROS) thus safely meets the strategic goal.

4.4 The Application of Scenarios in the Company's Strategic Management

The above-mentioned scenarios indicate a potential development in the planned period considered. When pursuing the development of key risks we are allowed not only to judge viability of the strategic goals determined, but also to timely execute relevant provisions, which enable the company to cope with the development that deviates from the original assumptions. In this way scenarios work as a tool of company's flexibility enhancement. This element is important preferably in a period when the development of business environment is turbulent and strategic management must respect this development as long as it wants to remain an effective tool. However, the identification of potential environment development directions and the assessment of their impacts on the company's performance do not complete the strategic planning process. The managerial competences are necessary for the subsequent implementation of decision-making procedures. An emphasis should be also placed on working with the strategic options (variants) that model the impact of fundamental managerial decisions within scenarios. An emphasis should be also laid on looking for optimum utilization of sources in order to ensure future competitiveness.

5. Benefits and Shortcomings of Scenario Approaches

5.1 Benefits of Scenario Approaches

The scenario approach contributes, to a large extent, to the deeper understanding of the influence of individual risks on both the strategic plan and investment project variant outcomes in terms of relevant assessment criteria. The importance of scenario development does not consist in accuracy and reliability of long-term predictions, but in better recognition of mechanisms which control the development of business environment and their acquirement by the team of investment analysts. This process

enhances the probability of timely recognition of upcoming critical discontinuities and their transformation into business opportunities which are instrumental in fulfilment of company's strategic goals.

The scenario approach can be used both in the **preparation of decisions, their choice and implementation.** In the former case the use is aimed at the elaboration of new company's concepts, the improvement of strategic management, the increase of company's perception of changes both in business environment and employees motivation or employees consideration. In the latter case the scenario use results in the deeper recognition of the situation, the strategy formulation and its assessment or the formulation of judgements and the preparation of proposals. The scenario approach leaves a single prospective development out of account and takes into consideration more alternatives of future development of business environment. In this way the scenario approach creates an alternative to the concept of "business as usual" and creates space for more complex understanding of uncertain future. Robustness of investment projects as well as their extent of flexibility from the point of view of the number and the extent of scenarios which are covered by this flexibility also belong to the important benefits of scenarios.

The **application of scenarios in risk management** as tools for the support of preparation and implementation of strategic plan and investment projects risk mitigation provisions cannot be omitted. Similarly, the preparation of contingency provisions, supposing that important and untreated risks occur, must also be properly highlighted. A limited demand for software support can be considered as a certain technical benefit of the scenario approach. Basically MS EXCEL is sufficient for mastering the scenario approach.

To illustrate the broad applicability of scenario approach, other important applications can be presented. The following examples can be given:

- **Investment portfolio development in an important Iranian company** which is composed of five business branches as petrochemistry, minerals quarry and their processing, cement production, machinery, financial and trade services. Typical features of this application were integration of scenarios, multicriteria assessment methods PROMETHEE and linear programing [16],
- **Investment projects risk assessment** in the Czech Republic which were taken from branches of chemistry (Fatty acid methyl ester – FAME production to be a component of biodiesel), pharmaceutical industry (antiglaucoma agent project for the treatment of glaucoma) and energy (solar power station construction project [30].
- **Identification and assessment of new business opportunities.** The objective was the application of the above-mentioned scenarios for searching for new opportunities found in the intersection point of processing industry and downstream branches [27].
- **Support of development strategy elaboration** by means of the integration of scenarios and operational research models with applications referring to energy [4], renewable energy sources utilization [20] and fishing [3].
- **Research, development and clinical testing of new** drugs represent considerably costly, time consuming and highly risky process. These attributes manifest themselves both in research and development phase (testing of thousands substances) and clinical testing (evaluation of new drug effects in clinical practice), when incidental side effects may even imply refusal of its registration [1].
- **Organizational goals modelling** or identification of prospective business targets [31].
- **Scenario planning for climate strategy development** by means of the application of questionnaire surveys combined with Delphi method (the examination of mutual social and economic factors and trends), dynamic fuzzy cognitive maps (e.g. the examination of mutual links among these factors) and Saaty method of multicriteria evaluation (the determination of key factors essential for scenarios formation) [2].
- **Decision support characterized by severe impacts** concerning the third set of sailing channel in Panama Canal [22].
- **Support of planning and decision making** with a view to the economic recovery during the recession period [22].

Only then is **scenario approach effective,** when it is conceived as a **continuous and steady process.** Under these circumstances managers are compelled to re-evaluate their view of business environment development and include effects which would have been otherwise omitted.

The interconnection of scenarios with the consideration about the future, including the application of the aforementioned **early warning systems,** provides signals on what possible scenario may come into effect and therefore it enables timely reaction to this development. Consequently it helps reduce an occurrence of severe problems which require crisis management execution. Transparency and communicability of every scenario is a prerequisite for a speedy and effective execution of the change. Business practice experience shows that inertia thinking ("things go in the same way as before"), incapability to perceive potential changes in business environment as well as their impacts on both the company and its core business resulted in endangering the very existence of even very successful companies in the past. (Copy machines producer Xerox can be set as an example).

5.2 Shortcomings and Restraints of Scenario Approaches

Shortcomings of scenario approaches are manifested especially in situations, where a great many risks exist that may furthermore acquire a great number of values. The continuous character of risks represents a limit case. Respecting a restricted number of risks only or substitution of continuous risks by discreet ones with a small number of values implies elaboration of lower number of scenarios, which do not provide an entire picture about the risks of the plan or project. Such a set of scenarios is quite often not representative.

If this is the case, then scenario approach cannot be used for the risk analysis of strategic plans or investment projects and it is inevitable to resort to more sophisticated tools, such as the Monte Carlo simulation [19], [24], and [28]. A combination of scenarios with the Monte Carlo simulation results in the concept of **conditional risk analysis,** which can also be useful [9]. Gugan [15] sees barriers to a fully-fledged scenario application in the set of causes, the most important being too narrow focus of scenarios, which do not cover their global extent, elaboration of scenarios that are, from the company's point of view, out of the possible impact scope. Among other barriers low engagement of the management team and even a substitution of scenarios for predictions should be ranked. The reservation, which is of some relevance, is that the most important risk factors are unpredictable when being assessed from the point of view of past and present times. This may imply the so-called **tunnel effect,** which comes out of the past and current well-known risk factors (prices, demand, costs, exchange rates etc.) and weakens sensitivity to searching for new, in the past unknown, risk factors [8]. According to this opinion, the main risk of scenario application rests on fact that it may result in the quantification of irrelevant risks. These objections are worth considering, since the aforementioned shortcoming can, to some extent, be weakened by the emphasis placed on the risk identification phase and its quality.

Another shortcoming, which hampers the scenario application, is the fact that this method lacks a **validation tool** that would enable the assessment of scenarios proposed. Typically, it is questionable if the decision maker actually has the most appropriate scenarios at disposal. Moreover, as per Mensonides [23], scenarios often miss internal logic, trustworthiness and dynamics. Scenarios very frequently fail in situations, where they are about to recognize all mutual links among heterogeneous subjects, activities and sources.

The applicability of scenarios is contingent upon their easy communication towards subjects, which decide about their application. As long as scenarios are too complex and their conclusions can be interpreted with difficulties only, then advantages of scenario approach may be turned into disadvantages and scenario approach may be refused as a principle.

5.3 Success Factors of Scenario Application in Strategic Management

The success of formation and application of scenarios are influenced by more factors, the most important are [6]:

- **Commitment of top management:** Without the support of top management the scenario formation is usually one-off activity;

- **Engagement of creative employees** from all company hierarchies as well as external specialists in scenario elaboration;
- Collecting **information for scenarios elaboration from multiple sources,** typically both internal and external ones;
- Respecting **the requirement of internal consistency and realistic nature** of each scenario (behind each scenario there should be a meaningful story);
- Respecting **conflict representativeness requirements** of the set of scenarios elaborated upon their restricted number;
- Avoiding tendency to trust too much to the capability of predicting the future and rely on **logic consideration and supporting analysis** which are based on facts;
- Neither being fixed to adaptation to already composed scenarios nor missing out the possibility of **actively influencing the future**;
- Continuous monitoring of the **development** of environment and depending on its results the ongoing updating of the set of scenarios composed;

Respecting these factors can considerably contribute to the application of scenarios as an important tool for the strategy development, strategic planning and strategic investment decision making.

Conclusion

The scenario application, while respecting risks known, significantly enhances the quality of strategic management which contributes to better company's stability, determination of realistic goals and, finally, to the increase of its market value. It is essential that the scenario approach abstracts from the simplistic view of the future to be personified by one possible environment development and takes into consideration the multiple development of the environment. This allows thinking and viewing strategies and strategic plans in more stratified manner, especially from the point of view of their possible outcomes. The scenario approach is applicable both in the stage of **decision making** and the stage of **decision preparation**. In the former case, scenarios are used as tools for the strategy and strategic plan variants selection or, as the case may be, for the selection of key investment projects variants (for more see e.g. [10], [21]). In the latter case, scenarios enable a deeper recognition of the situation and support the strategy or strategic plan variants elaboration. These plans are either sufficiently robust or flexible so that the company may react to the change of a situation and development can be in consonance with other scenarios. This flexibility is supported by the scenario interconnection with early warning systems and strategic risk management. The scenario approach proves its benefits even in communication with company's stakeholders, since all possibilities and company's potential growth in the context of current business environment development can be bolstered up by arguments. Last but not least, the scenario approach is beneficial to the determination of controlling value limits in controlling processes. The example of a scenario application in a specific company shows that the company management has to draw a great deal of attention to scenario planning within the framework of strategic planning activities. The enhanced quality of decision-making processes, which is reflected in the effectiveness of company's tactical and operational management, is considered to be the key benefit.

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References

[1] BENDA, N., BRANSON, M., MAURER, W., FRIEDE, T. Aspects of Modernizing Drug Development Using Clinical Scenario Planning and Evaluation. *Drug Information Journal*. 2010, Vol. 44, No. 3, pp. 299-315. ISSN 2168-4790.

[2] BILOSLAVO, R., DOLINŠEK, S. Scenario planning for climate strategies development by integrating group Delphi, AHP and dynamic fuzzy cognitive maps. *Foresight*. 2010, Vol. 12, No. 2, pp. 38-48. ISSN 1463-6689.

[3] BRYANT, J., MEADOWS, M., MORECROFT, J., O'BRIEN, F. Gone fishing: a case study. In: O'BRIEN, F., DYSSON, R.G. (Eds.). *Supporting Strategy: Frameworks, Methods, and Models*. Chichester: John Wiley & Sons, 2007. pp. 369-393. ISBN 978-0-470-05717-9.

[4] BURT, G. Towards the integration of system modelling with scenario planning to support strategy: the case of the UK energy industry. *Journal of the Operational Research Society*. 2011, Vol. 62, Iss. 5, pp. 830-839. ISSN 0160-5682.
[5] CLEMENS, P.L. *Event Tree Analysis.* 2nd ed. Sverdrup, 1990. 13 p. Available also from: http://www.fault-tree.net/papers/clemens-event-tree.pdf.
[6] COURTNEY, H. Decision Driven Scenarios for Assessing Four Levels of Uncertainty. *Strategy and Leadership*. 2003, Vol. 31, Iss. 1, pp. 14-22. ISSN 1087-8572.
[7] FOSTER, M.J. Scenario Planning for Small Business. *Long Range Planning*. 1993, Vol. 26, No. 1, pp. 123-129. ISSN 0024-6301.
[8] FOTR, J., KISLINGEROVÁ, E. Integrace rizika a nejistoty do investičního rozhodování a oceňování. *Politická ekonomie*. 2009, Vol. 57, Iss. 6, pp. 801-826. ISSN 0032-3233.
[9] FOTR, J., PÍŠEK, M. *Exaktní metody ekonomického rozhodování.* 1. ed. Praha: Academia, 1986. 165 p. ISBN 21-013-86.
[10] FOTR, J., PLEVNÝ, M., ŠVECOVÁ, L., VACÍK, E. Multi-Criteria Project Portfolio Optimization under Risk and Specific Limitations. *E+M Ekonomie a Management.* 2013, Vol. 16, Iss. 4, pp. 71-88. ISSN 1212-3609.
[11] FOTR, J., ŠVECOVÁ, L., HRŮZOVÁ, H., RICHTER, J. *Manažerské rozhodování. Postupy, metody a nástroje.* 2. ed. Praha: Ekopress, 2010. ISBN 978-80-86929-59-0.
[12] FOTR, J., SOUČEK, I. *Investiční rozhodování a řízení projektů.* Praha: Grada Publishing, 2011. ISBN 978-80-247-3293-0.
[13] FOTR, J., VACÍK, E., SOUČEK, I., ŠPAČEK, M., HÁJEK, S. *Tvorba strategie a strategické plánování. Teorie a praxe.* Praha: Grada Publishing, 2011. ISBN 978-80-247-3985-4.
[14] GRAY, P. Competitive Intelligence. *Business Intelligence Journal.* 2010, Vol. 15, No. 4, pp. 31-37. ISSN 1918-2325.
[15] GUGAN, A. *Successful Scenario Planning* [online]. JISC infoNet, 2008-11-19 [cit. 2013-11-15]. Available from: http://www.jisc.ac.uk/publications/generalpublications/2008/scenarioplanningflyer.aspx.
[16] HANAFIZADEH, P., KAZAZI, A., BOLSHANI, A.J. Portfolio design for investment companies through scenario planning. *Management Decision.* 2011, Vol. 49, No. 4, pp. 513-532. ISSN 0025-1747.
[17] HEIJDEN, Van Der, K. The Art of Maverick Thinking. *Scenario & Strategy Planning.* 1999, Vol. 1, Iss. 1, pp. 19-23. ISSN 1466-4062.
[18] HEIJDEN, Van Der, K. *Scenarios, the Art of Strategic Conversation.* Chichester: John Wiley & Sons, 2005. ISBN 0-470-02368-6.
[19] HNILICA, J., FOTR, J. *Aplikovaná analýza rizika ve finančním managementu a investičním rozhodování.* 1. ed. Praha: Grada Publishing, 2009. 262 p. ISBN 978-80-247-2560-4.
[20] HOWICK, S., ACKERMANN, F., ANDERSEN, D. Linking event thinking with structural thinking: methods to improve client value in projects. *System Dynamics Review.* 2006, Vol. 22, No. 2, pp. 113-140. ISSN 1099-1727.
[21] KRACÍK, L., VACÍK, E., PLEVNÝ, M. Application of the multi-project management in companies. In: *Proceedings of the 11th International Conference on Liberec Economic Forum 2013.* Liberec: Technical University of Liberec, 2013. pp. 316-324. ISBN 978-80-7372-953-0.
[22] MARREN, P.B., KENNEDY Jr., P.J. Scenario planning for economic recovery: short-term decision making in a recession. *Strategy & Leadership.* 2010, Vol. 38, No. 1, pp. 11-16. ISSN 1087-8572.
[23] MENSONIDES, M., HUISMAN, B., DIGNUM, V. Towards Agent-Based Scenario Development for Strategic Decision Support. In: *Lecture Notes in Computer Science. Agent-oriented Information Systems IV.* 2008, Vol. 4898, pp. 53-72. ISBN 978-3-540-77989-6.
[24] MUN, J. *Modelling Risk*. 2nd ed. New York: John Wiley & Sons, 2010. ISBN 978-0-470-59221-2.
[25] O'BRIEN, F., MEADOWS, M., MURTLAND, M. Creating and using scenarios – Exploring alternative possible futures and their impact on strategic decisions. In: O'BRIEN, F.A., DYSON, R.G. (Eds.). *Supporting Strategy: Frameworks, Methods and Models.* Chichester: John Wiley & Sons Ltd., 2007. pp. 211-247. ISBN 978-0-470-05717-9.
[26] PEARSON, I., LYONS, M. Re-evaluation In An Age of Uncertainty. *Scenario & Strategy Planning.* 1999, Vol. 1, Iss. 1, pp. 3. ISSN 1466-4062.
[27] PIIRAINEN, K., KORTELAINEN, S., ELFVENGREN, K., TUOMINEN, M. A scenario approach for assessing new business concepts. *Management Research Review.* 2010, Vol. 33, No. 6, pp. 635-655. ISSN 2040-8269.
[28] PRAKASH, A. Scenario planning for service quality: A Monte Carlo simulation study. *Journal of Strategy and Management.* 2012, Vol. 5, Iss. 3, pp. 331-352. ISSN 1755-425X.
[29] ŠPAČEK, M. *Scénářové a simulační přístupy v analýze rizika investičních projektů.* Doctoral

dissertation. Prague, 2009. University of Economics.
[30] TESSUN, F., HERMANN, A. Harnessing Potential Future. *Scenario & Strategy Planning.* 1999, Vol. 1, Iss. 1, pp. 8-12. ISSN 1466-4062.
[31] ZORIC, J., BRAEK, R. Scenario based techno-business. Analysis of service platforms and their service portfolios. *Telecommunication System.* 2011, Vol. 46, Iss. 2, pp. 95-116. ISSN 1018-4864.

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Abstract

SCENARIOS AND THEIR APPLICATION IN STRATEGIC PLANNING

Emil Vacík, Jiří Fotr, Miroslav Špaček, Ivan Souček

The article deals with the concept of scenario planning. Scenarios, as opposed to usual prediction methods, are focused on the identification of discontinuities in the development and help the organization cope with sudden changes and noticeably contribute to its survival. Contemporary methods of scenarios construction work on need to ensure flexibility of the strategic plan and get the firm ready for a quick reaction when set trigger points specifying the corresponding scenario come to pass. Processing of business environment information, known as Business Intelligence, becomes necessity. Based on the methodological platform, it describes in detail the stepwise process of scenario construction. The very process of scenario elaboration goes through six basic steps, Identification of risk factors and determination of their importance; Selection of key risks which, according to the company's opinion, fundamentally influence fulfilment of strategic goals; Formulation of basic scenarios and testing their consistency; Determination of probability of scenarios occurrence and Performing a "gap analysis" for the sake of determining the extent of strategic goals fulfilment.

There are various types of scenarios which might be respected due to the development of entrepreneurial environment introduced and discussed. Respecting the indicated risk factors and their influence on key risks of the financial plan, the spread of scenarios is being drafted. It is typical of business practice to work with 3–4 scenarios. Besides determining the impact of a risk on the firm's performance (the rate of fulfilling set strategic goals), the probability assessment of each scenario is also necessary. Outputs from constructed scenarios are to be worked up into a particular strategic option, which may be used as a qualified base for the strategic decision-making process.The practical application shows how the methodology used raises flexibility in strategic planning of the firm.

Key Words: *Scenarios, strategic planning, investment decision making, risk, risk analysis, Monte Carlo simulation.*

JEL Classification: *M21, O22.*

DOI: *10.15240/tul/001/2014-3-010*

EMPIRICAL STUDY OF INTANGIBLE ASSETS IN ROMANIAN MUNICIPALITIES

Ovidiu Constantin Bunget, Rodica Gabriela Blidisel, Liliana Feleaga, Irimie Emil Popa

Introduction

Nowadays technology provides tools with enormous intangible benefits to entities. While the multitude changes in the economic world challenges the financial stability, the importance of the information disclosed becomes essential in order to be taken good decisions. It is widely recognized that a key driver in the new world is knowledge [3], [36].

Economic success is increasingly based on upon the effective utilization of intangible assets, but despite of their significance, the literature reveals a low level of interest in their identification, measurement and disclosure, especially in the public sector. Despite the interest of the private sector, public sector entities have made less effort in this way, which is to be regretted, since intangibility is more present in the public sector than in private sector. The literature points out arguments such as: multiple objectives of a non-financial nature, more intensive use of the intangible assets (especially related to human resources and knowledge), the services – essentially intangible, as the generally final product of public entities.

With the aim to improve the quality of financial reporting of public sector entities for a better informed judgment of the resource allocation decisions as well as an increasing transparency and accountability, the International Public Sector Accounting Standards (IPSAS) became the definitive set of accrual-based international accounting standards for the public sector. In the framework of our subject the International Public Sector Accounting Standard no. 31 [17] places the public entities under the obligation to recognize intangible assets in the balance sheet, complying with three critical attributes of identifiability, control and future economic benefits or service potential.

In spite of the accounting rules that establish generally accepted criteria regarding the measurement, recognition and disclosure of these intangible assets, the literature points out that subjective factors could come into play, permitting that their value to be manipulated easily, especially for so-called intellectual capital. Subjective measurement could generate bad information to stakeholders that is a significant problem. Besides the accounting approaches, the literature reveals both monetary and non-monetary intangible assets measurement methods, developed during the time, most of them being transposed in the public sector from the private one, having the purpose a better internal decision making. Given the level of intangible assets trend development, the authors support the idea of three disclosure levels as regard the development stages in the process of measurement and recognition of full intangible assets.

Besides the costs and benefits of disclosing information about intangibles, a supplementary question could arrive as regards the determinants of intangible assets reporting.

At European level, according to the Lisbon Strategy, the management of knowledge and innovation represents a priority, intended to make the European Union the most competitive and dynamic economy in the world. Romania, as an European Member state, must comply with this strategy. In order to reduce the disparities between Romania and the other Member States, to have a regional development based on performance and better accountability, the Romanian government aligned to the European

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and international standards and implemented different reforms in public administration [28], [26], [29], [30]. Also, for a better decision making, the accounting system was reformed; in 2006 the Romanian public sector passed from a cash-based accounting system to an accrual-based accounting system [35] with identified elements of International Public Sector Accounting Standards regulation.

While there are few research papers in the literature in the field of intangible assets in public sector, especially in the local public administration, theoretical and empirical contributions of this paper are auspicious for the issues establishment and the state of knowledge in Romanian municipalities' awareness, transparency and disclosure of public information of general interest. The motivation is even greater as these aspects of intangible assets represent a subject of national and international debate. Transformations performed by the Romanian public administration in the process of regional development, particularities of human resources knowledge improvement once with these reforms, technical and informational system implemented to support the innovation gives us a particular research advantage compared to others in the relevant literature.

Generally, the wealth created by the knowledge and intangible resources is seen mostly in municipalities with a relatively large population and a major economic, social, political and cultural significance. In this respect our research occurs in time to find out the intangible assets disclosure level of all the Romanian municipalities.

Considering the identification, measurement and disclosure of intangible assets a stringent research problem, in the light of the theoretical evidences, we investigate the stage of intangible assets process developed by the Romanian municipalities as important catalysts of political and public visibility as well as promoters of information production, taking into account as main investigation items the awareness about intangible assets importance of the decision makers in these entities as well as the disclosure level and the most influential factors in this disclosure.

The research approaches at empirical level the knowledge of financial accounting department representatives from Romanian municipalities about the assets non physical in nature, the criteria for recognition and their importance of disclosure. While more and more municipalities are looking on New Public Management techniques which reflects the huge changes which have taken place in the last 15 years towards so called "knowledge economy", it is clear that information on intangible resources should be integrated in the decision-making process, improving the visibility and having as a result important competitive advantages.

The research is based on the content analysis technique, in order to find out if the annual reports of Romanian municipalities reflect, in their disclosed accounts, the recognized importance of intangible assets in today's economy and in the international accounting doctrine as well as if there are factors that influence this disclosure. Taking into account a dichotomist procedure based on disclosure and application/ /relevance observations, the results reveal the low disclosure of intangible assets according to the requirements of IPSAS 31 together with national standards. Size explained by the population number and the logarithm of assets are factors that influence the disclosure of intangible assets information.

Moreover, following in-depth semi-structured interviews, we found out the awareness of representatives of financial accounting department of Romanian municipalities as regards the identification, measurement and disclosure of intangible assets.

The paper starts by identifying the literature review in the field of intangible assets identification, measurement and disclosure, main theories being associated with this problem, followed by the definition of the dependent and independent variables selected. The structure continues with the results analysis: the descriptive statistics of the variables under study, followed by a by a multivariate analysis, with the intent to conclude the existence or not of a linear association between the disclosure index created and the explanatory variables considered in our study. We end by presenting our main conclusions.

1. Literature Review

1.1 Features of Changing Catalyst in Public Sector

Numerous changes in structure, financing, and services delivered by the public sector challenges

it to face the risk that can arise. Therefore, the public sector should provide good analysis and reporting and encourage better use of information to support good decision-making.

In the reform process the public sector transposed approaches from the private sector, there were identified six dimensions: privatization, marketing, corporate management, regulation, decentralization and political control [40]. Public sector has been undertaken all these reforms to meet a number of objectives aiming at enhancing accountability, strengthening governance and increasing transparency. The most important feature of these reforms revolves around the relevance, efficiency and effectiveness of the public sector, linking the objectives with resources and outcomes.

The ongoing crisis in several countries around the world has demonstrated the challenges of maintaining financial stability and the importance of the information disclosed in order to make good decisions. Many governments are exploring the adoption of accrual-based accounting frameworks in order to improve their decision-making ability to prevent and respond to these challenges. International Public Sector Accounting Standards (IPSAS) are considered the definitive set of accrual-based international accounting standards for the public sector. They are issued by the IPSAS Board (IPSASB) for use by public sector entities around the world in the financial statements preparation, aiming to improve the quality of financial reporting general purpose, leading to better informed judgment of the resource allocation decisions, thereby increasing transparency and accountability. IPSASB adapted the private sector IFRS to the public sector context when appropriate, attempting, wherever possible, to maintain the accounting treatment and original text of the IFRS unless there is a significant public sector issue which warrants a departure.

But there are disparities between private and public sector, many of them arousing heated debates, being generated by:

1. the different conceptual framework, the private sector standards providing principles for certain economic phenomena that are irrelevant to the operations of public sector entities;
2. the prevalence of the non-exchange transactions within the public sector which emphasizes disputes as regards their measurement and recognition, the service potential being an important part of the definitions and recognition criteria;
3. comparison of the actual financial performance of an entity with the approved budget of that entity, where the budget is publicly available, with the increased focus on stewardship, service delivery and budget management in the public sector.

1.2 Service Potential – a Parameter of Public Sector Assets

Based on these disparities, the paper focuses on the special role of assets in public sector, those that are likely to be non-cash generating. Of these, in recent years, intangible assets have attracted most accounting-related debates.

Assets are the fundamental concept in accounting. Assets, also called economic resources, are the lifeblood of both business enterprises and not-for-profit organizations [14]. In the private sector the assets are important information due to their capacity to generate profits. The IASB gives the following definition: *"An asset is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity."* We cannot say the same thing about public sector. Many of the assets of public sector entities are acquired or incurred as a result of the entity's service delivery mandate. Therefore, IPSAS introduces the concept of service potential as part of the definitions and recognition criteria. Service potential is also a supplementary recognition criterion to account for items that do not result in the inflow or outflow of economic benefits, where an item either contributes to or detract from the entity's ability to deliver its services [13].

IPSAS 1 describes an asset as *"embodying service potential"*. According to IPSAS 1 the assets are *"resources controlled by an entity as a result of past events and from which future economic benefits or service potential are expected to flow to the entity".*

As regards this definition there are discussions on the IPSASB agenda, the respondents questioned sustaining that an asset do not necessarily delivers an inflow of service potential to the entity that holds it, considering that an asset is used by the entity to deliver an outflow of services to the public, suggesting the

following definition: "An asset is a resource controlled by the entity as a result of past events, from which future economic benefits are expected to flow to the entity, or from which service potential is expected to be extracted by the entity in the future" [18].

Public entities frequently expend resources or incur liabilities on the acquisition, development, maintenance, or enhancement of important intangible resources such as organizing a world-wide event, scientific or technical knowledge improvement, development costs, design and implementation of new processes or systems, patents, copyrights, licences, intellectual property and trademarks (including brand names and publishing titles), computer software, motion picture films, lists of users of a service.

The R&D and the introduction of information technology in public services (e.g. municipality) may increase the citizen satisfaction, reducing queues in the provision of a service by allowing individuals to apply for it through the internet. The literature [7] points out the importance of identifying intangible assets, as they acknowledge their relevance in order to take better decisions and aim to prove to the public the performance as well as quality of management processes.

The importance of the information provided by financial statements as regards financial position, business performance and cash flows has never been questioned given that it is the basis for making rational economic decisions to a wide range of users, but the processes of globalization, internationalization and concentration of economic power replaced the traditional economy with the knowledge-based economy in which entities base their value generating and gaining a competitive advantage on intangible assets [24].

It is evident that intangible assets are both large and important, but current financial statements provide very little or no information about these assets and as a result, financial statements are incomplete, the information user not having accurate and complete knowledge about the intangibles owned and managed. [34]. The overwhelming importance attached to intangibles and any attempt to ignore them in financial reporting will lead to distortions and incomplete performance measurement [10]. Intangible assets are one of the components that must have adequate disclosure [20].

Many empirical studies on intangible assets in the private sector have now been published, but in contrast with the private sector, the identification, valuation and disclosure of intangible assets in the public sector is not very well developed. In this respect, there were identified three main characteristics of the public sector:

1. While private's sector main objectives are profitability and firm value, the public administrations have multiple objectives of a non-financial nature;
2. Even if both the public and the private sector use the same production inputs – human resources, knowledge, money, raw materials, and plant – the public sector makes more intensive use of the first two, and these are intangible;
3. The final product of public administration is a service, and this is essentially intangible.

IPSAS 31 places the public organizations under an obligation to recognize intangible assets in balance sheet. According to IPSAS 31, paragraph 16, an intangible asset is an identifiable non-monetary asset without physical substance.

In public sector there could be identified different intangible assets, the regulation bodies offering examples for this purpose. Tab. 1 presents a comparison of intangible assets examples provided by Romanian regulations for public sector accounting and IPSAS.

We point out that in Romania, in the spirit of New Public Management philosophy, beginning with January 1st 2006, public sector institutions have realized the transition from cash accounting regulated since 1970 by Order of Public Finance Ministry no. 596 to accrual accounting regulated by the Order of Public Finance Ministry no.1917/2005 (referred to as OMFP 1917/2005 updated) for approving *the Methodological Norms concerning the organization and conducting of public sector accounting, the Chart of accounts and the Instructions for applying it,* being inspired from IPSAS provisions [6].

Also there are different examples, according to IPSAS 31 intangible assets have to comply with: identifiability, control (ability to obtain benefits from the asset) and future economic benefits or service potential (e.g. revenues or future costs decreasing). In order to fulfil these characteristics to satisfy the normal asset recognition criteria the intangible

Tab. 1: Intangible assets classes provided by OMFP and IPSAS

OMFP 1917/2005 updated	IPSAS 31
Other intangible assets (**computer software** and other intangible assets);	**Computer software;** Brand names;
Licences;	**Licences;**
Concessions, **patents**, trademarks and similar rights and assets;	Copyrights, **patents**, and other industrial property rights, service and operating rights;
Recordings of cultural and sports events such as: theatrical, radio or television programs, musical works, sporting events, literary, artistic or recreational recordings made on film, magnetic tape or other media owned by the institution, which are not subject to amortization;	Recipes, formulae, models, designs, and prototypes; Mastheads and publishing titles; Intangible assets under development.
Development costs.	

Source: own

assets meet difficulties. For this purpose, many value relevance studies are especially difficult to interpret in this area. For the USA private sector the AAA Financial Accounting Standards Committee, 2003 discusses the presence of a competitive market for assets; otherwise do not earn abnormal returns. The literature [19], [25], [1] raises the issue about the reliability and comparability of intangibles information, pointing out that there are also problems with choosing a measurement basis:

1. while using the cost as the measurement basis, it is difficult to know which costs relate solely to the acquisition of intangibles, when all aspects of the entity's operations affect an intangible like customer satisfaction and it is difficult to determine the portions of these costs that have future benefit;
2. while using the fair value as the measurement basis, we are a "long way" from being able to value many intangibles, such as customer satisfaction, given the many industry and competitive forces that affect intangibles' values.

1.3 Intellectual Capital Models in the Public Sector

One of the major assets of an organization is intellectual capital, since it promotes competitive advantages that are the base of value generation [11], [46], [22], [39].

The theory of intellectual capital has appeared in the past decade in response to the growing accomplishment of the importance of information and knowledge. Because it was first conceptualized during the same time period with the ideas of knowledge management and human capital, it became an important part of organizational discussion [16].

Although the intellectual capital concept was developed as a framework to analyze the contribution of intellectual resources of the private entities, due to its importance it was soon taken over by public and non-profit organizations [31], [23], [38]. The intellectual capital is the capacity it has to transform knowledge and intangible resources into wealth [4]. Moreover, the intellectual capital is distinguished as the value of the ideas generated by a human and structural capital which produces and shares knowledge [12].

In the knowledge era we can conclude that necessities like the demand of stakeholder for greater transparency, the increasing competition and greater autonomy push the municipalities towards the adoption of new reporting systems which should necessarily incorporate intangibles.

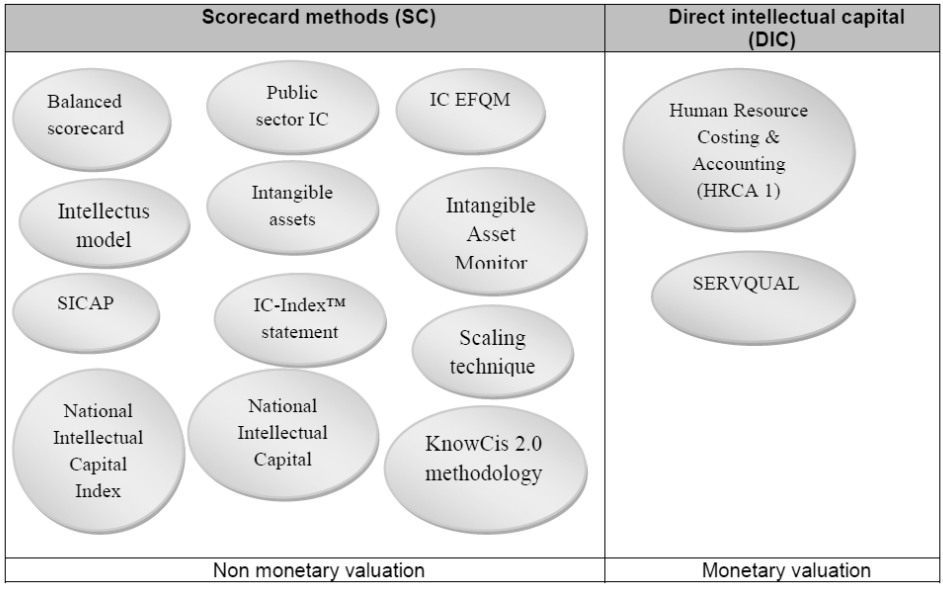
1.4 Methods Developed for Measuring Intangible Assets besides the Accounting Approach

In order to administrate the entity better, it is necessary to disclose the intangible assets into the financial statements and this idea is device as "If you don't measure, you can't administrate" [41]. However, it is denoted that this

approach can be misleading. According to Intangible assets aren't less assets than the others [45], [49]. The rules of displaying intangible assets in financial statements must be the same as the other assets [44]. But since subjective factors come into play and there is a lack of generally accepted criteria at the measurement and evaluation of these intangible assets, this value can be manipulated easily. Subjective evaluation and measurement will generate bad information to stakeholders.

Parallel with accounting there were developed, especially for the private sector different intangible assets measurements to monitor performance (control), acquire/sell business (valuation), report to stakeholders, guide investments (decision), uncover hidden value (learning), divided into four main categories: Direct Intellectual Capital Methods, Market Value Methods, Asset Return and Scorecard Methods. If the Intellectual Capital models applied easily in the private sector rely on the difference between the market value of the firm and its book value, in the public sector they should highlight how intangible assets are used to improve the quality of the services offered and their relevance for management. Fig. 1 shows the identified intangible assets measurement methods running in the public sector presented by the international literature, observing that in public sector prevails the non-monetary valuation methods, especially scorecard methods which attempts to identify different components of intangible assets by means of indicators.

Fig. 1: Intangible assets measurement methods within the public sector



Source: own

More and more, once with the development of information and management systems in public sector there is a need that aim to estimate and control intangible capital as the main source of wealth creation [32]. But, on the other hand, the lack of competition within a monopolistic framework is far from an appropriate setting to stimulate the development of new practices in public sector. New Pubic Management requires the provision of good quality services and this might contribute to the development of intangible measurement in this context. Public sector entities have multiple objectives which are of an intangible nature.

Moreover, services provided by public entities are intangible. The main resources of the public sector (e.g. human resources and knowledge) are intangible as well.

Having introduced the general framework for intangible assets in the public sector, the literature emphasizes the general consensus regarding the necessity to identify, to measure and to disclose the intangible assets held by each institution, while presently they are inadequately disclosed in traditional annual reports [42].

The literature reveals that some of intangibles were not being recognized on the Statement of Position in the public sector entities financial statements, providing alternatives to help the improvement of the intangible capital measurement and recognition. There is widely recognized that voluntary disclosures indicates that additional data about unrecognized intangible assets would be benefic because of the importance of intangibles. Also there are recommendations as regards disclosure rather than recognition of internally generated intangibles. This will lead to the reporting that reflect the qualities of relevance and reliability.

2. Research Methodology and Data

2.1 Research Purpose and Objectives

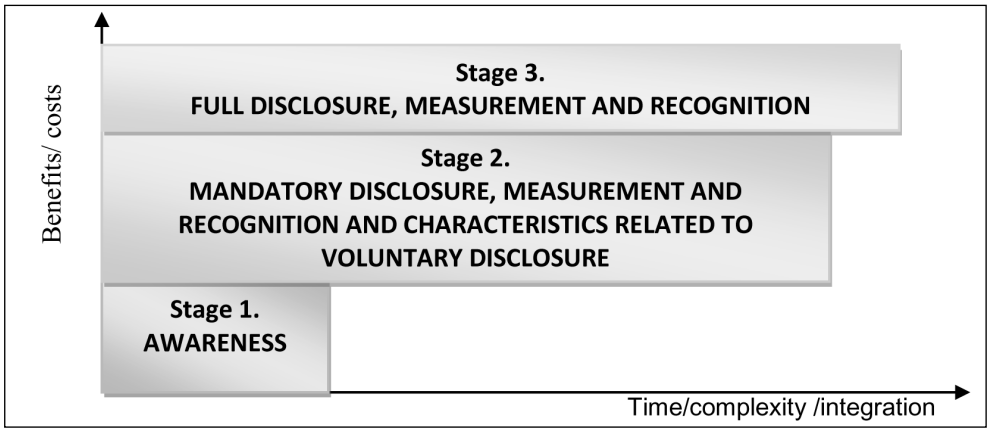
Before being found widely recognized ways of measuring and recognizing all the intangible assets that allow standardization of information, local governments must realize the purpose and benefits of the intellectual capital and to find indicators that characterize these intangible assets to be voluntarily disclosed. According to this statement and relating to benefits/ /costs on the one hand and to time/complexity/ integration on the other hand, in our opinion there are three disclosure levels as regard the development stages in the process of measurement and recognition of intangible assets in local public administration (Fig. 2):

Stage 1: Awareness about mandatory and voluntary disclosure, measurement and recognition;

Stage 2: Mandatory disclosure of intangible assets and characteristics related to voluntary disclosure of intellectual capital;

Stage 3: Full disclosure, measurement and recognition of all intangible assets (with full disclosed elements regarding intellectual capital).

Fig. 2: Development stages in the process of measurement and recognition of intangible assets in local public administration



Source: own

In the light of the theoretical evidences, the purpose of our research is to verify to what stage intangible assets process is developed in Romanian local public administrations, the awareness and disclosure as well as the most influential factors in this disclosure.

Therefore, for the elaboration of this paper, we have defined the following objectives:

- To analyze the awareness of the importance of identification, measurement and disclosure of intangible assets in Romanian municipalities;
- To ascertain the extent of disclosure level of intangible assets in accordance with their measurement and recognition, relevant for the Romanian municipalities considered and
- To determine the most influential factors of intangible assets disclosure according to the national and international accounting standards applied in Romanian municipalities;
- To find out elements of voluntary disclosure in respect with full disclosure, measurement and recognition of intangible assets in Romanian municipalities.

Demonstrating the hypotheses arising from these objectives, we can find out the development stage in the process of disclosure, measurement and recognition of intangible assets in Romanian municipalities.

2.2 Established Theories Related to the Present Research Purpose

The disclosure of accounting information is based on social and politic theories. Out of them we remind the legitimacy theory and stakeholder theory.

According to the legitimacy theory, which emerged from the political process, the social disclosures can be viewed as a method of responding to the changing perceptions [37]. The regulatory bodies have the legitimacy to operate; the failure to comply with these regulations may increase the political costs and costs of information asymmetry. Therefore, the entities may have the incentive to disclose information to minimize these costs. One of the determinants analyzed in our work related to the legitimacy theory is visibility, which is a measure of the entity size, and openness on the financial market.

The notion of stakeholder theory as it originates and belongs to the private-sector entities sets out a possibility to be applied in public-sector framework also for either managerial decision making or organizations understanding and implementations [21]. The stakeholders' theory emphasizes the organizational responsibility in the disclosure of entities information for stakeholders concerning the most important activities, the main source of disclosure being through financial statements. The content analysis of local public administration reports by several stakeholders justifies the importance of this theory in our study.

2.3 Sample Selection and Research Methodology

Nowadays, in the technology era, the wealth created by the knowledge and intangible resources is seen mostly in larger towns with a high degree of urbanization, with a relatively large population and a major economic, social, political and cultural significance. Romania, as an European Member state, must comply with the Lisbon Strategy, as a process based on the management of knowledge and innovation intended to make the European Union the most competitive and dynamic economy in the world. In order to fulfil the international strategies, Romanian municipalities promoted numerous reforms for a better transparency, decision making and public information disclosure. One of the most important information in local public administration is that related to the intangible assets, as they represent the nucleus of the activities performed and services provided. In this respect, our research tries to find out the intangible assets measurement, recognition and disclosure stage of 104 Romanian municipalities' sample. In Romania, municipalities are defined as administrative units that fulfil minimal quantitative and qualitative criteria [27].

The research methodology is based on the content analysis technique, applied to all the 104 Romanian municipalities' annual reports, requested by mail or downloaded via municipalities' website. Moreover, 11 in-depth semi-structured interviews were performed with representatives of financial accounting department of Romanian municipalities in order to find out the awareness of the identification, measurement and disclosure of intangible assets. The data were collected during July–October 2013 for the 2012 annual report.

2.4 Variables Used, Data Processing and Results

As regards the variables used, firstly we describe the dependent variable and then we define the independent variables considered appropriate for the development of this empirical study.

Dependent variable

The paper points out the disclosure index of intangible assets in the financial statements of 104 municipalities from Romania, taking as a reference the disclosure requirements stated in OMFP 1917, complemented with IPSAS 31, using the dichotomist procedure, where the value 1 is given if the local public administration discloses the issue in question and value 0, if it does not. The score given to each item that composes the disclosure index is additive.

We share Cooke's idea [8] presented in numerous research papers in which entities that disclose the most important items also disclose the least important ones, the disclosure index of entities that do not disclose non-relevant items should not be penalized, arguing that if their report does not mention the disclosure of an item, it is concluded that this item was not relevant to the entity in that period. In the same way, if an item considered relevant was not disclosed it is clearly considered that there was no disclosure. Thus, the disclosure index is calculated for the application of the above mentioned by calculating the score of those elements disclosed or of those elements applicable. After establishing the disclosure index, a scoring sheet was developed to assess the extent of disclosure. If a municipality disclosed an item of information included in the index, it received a score of 1, and 0 if it is not disclosed [8]. The method of computing the disclosure score for each municipality can be expressed as follows:

$$DIV\ 31 = IA_{OMFP1917} + C^{IA_{IPSAS31}}_{IA_{OMFP1917}} \quad (1)$$

$$IA_{OMFP1917} = \sum_{j=1}^{104} \frac{\alpha_j}{n} \quad (2)$$

$$IA_{IPSAS\ 31} = \sum_{j=1}^{104} \frac{\beta_j}{p} \quad (3)$$

where:

DIV 31 represents the total aggregate disclosure score;

$IA_{OMFP1917}$ represents the aggregate disclosure score in accordance with OMFP 1917;

$IA_{IPSAS31}$ represents the aggregate disclosure score in accordance with IPSAS 31;

$C^{IA_{IPSAS31}}_{IA_{OMFP1917}}$ represents the complement of aggregate disclosure score in accordance with OMFP 1917 on the aggregate disclosure score in accordance with IPSAS 31;

α_j is 1 if the j^{th} item is disclosed or 0 if it is not disclosed in accordance with OMFP 1917 and n the maximum score each municipality can obtain in accordance with OMFP 1917;

β_j is 1 if the j^{th} item is disclosed or 0 if it is not disclosed in accordance with IPSAS 31 and p the maximum score each municipality can obtain in accordance with IPSAS 31.

In this case, the key fact is whether or not a municipality discloses an item of information in the annual report but does not analyze the disclosure quality of a specific item. It is noted that municipalities were not penalized for nondisclosure of an item if it was deemed to be irrelevant to its activities. For this purpose the entire annual report was read to assess the relevance of a particular item of information to the municipality.

Independent variables

The relationship between the dependent variable (DIV 31) and the independent variables (SIZE, ASS, PIBA, CLA, PQUOT) have been analyzed. The core paper which stays at this judgment is that of [43]. The general description and measurement of independent variables is presented in Tab. 4.

SIZE (SIZE)

The size is the most used variable in the literature about disclosure determinants and in most studies it explains the variability of the disclosures. It is seen from two points of view, as following:

a) *Size as a measure of political and public visibility* – Size is the proxy variable in political consideration [47]. Larger entities suffer of greater political pressure, and therefore, they increase their disclosure in

Tab. 4: Independent variable description

Independent variables	Description	Measurement
SIZE	Size	Municipality size measured by the total inhabitants
ASS	Assets	Logarithm of the asset value of the year for each municipality
PIBA	Percentage of intangibles in the balance sheet	Measured by percentage of intangibles over total assets
CLA	Intangible assets	Number of intangible classes recognized according to IPSAS 31 paragraph
PQUOT	Publicly quoted	1 for publicly quoted, 0 if not.

Source: own

order to reduce political costs [34]. Large entities attract greater interest or public visibility for financial statements users.

b) *Size related to the production of information* – Large entities, generally, use more sophisticated information systems, which allow disclosing more transparent information.

This variable has been measured in different ways in studies on intangible assets disclosure: logarithm of the asset value [9], [5] and municipalities number of inhabitants. Based on the theory, we state the following hypothesis: *H1 – There is a positive relationship between the municipality size and the disclosure of intangible assets in its financial statements.*

PERCENTAGE OF INTANGIBLE ASSETS (PIBA)

This variable is used to study if a greater percentage in investments in intangible assets reported in the financial statements over total assets of a municipality encourages greater disclosure. This approach is described also in other studies [33]. Therefore, we can state the following hypothesis: *H2 – The municipalities with the largest value of intangible assets accounted in their balance sheets show a higher disclosure index.*

CLASSES OF INTANGIBLE ASSETS (CLA)

IPSAS 31 paragraph 118 establishes that public entities must disclose their intangible assets grouped by classes, defining a class of intangible assets as a grouping of assets of a similar nature and use in an entity's operations (paragraph 72). We complement the investment intensity level in intangible assets with the level of diversity. Therefore, in order to study the disclosure of intangible assets in the Romanian municipalities analyzed, we suppose that a greater variety of intangible assets can lead to a greater disclosure since a greater number of intangible assets classes could promote and provide wider and more varied information about them. On the basis of this evidence our third hypothesis is: *H3 – The larger the number of intangible assets a municipality presents, the greater is the disclosure index of intangible assets.*

An important indicator denoting economic and financial transparency is capital market trading. Therefore, we take into account in our study a dummy variable that reveals the extent to which municipalities perform traded transactions on the Bucharest Stock Exchange, The Romanian stock exchange where the municipalities trade municipal bonds: *H4 – The disclosure index of intangible assets is bigger if the municipality is publicly quoted.*

Descriptive analysis of the data

In order to analyze, interpret and carry out the statistic inference on the population sample, we describe in Tab. 5 the descriptive statistics of the quantitative variables.

As for the dummy variable included in this study, we found that 10.57% of municipalities are publicly quoted.

Analysis of the results of the statistical tests

In order to verify whether the variable PQUOT is statistically significant with the index DIV31, we preceded the Mann-Whitney test, which allowed us to verify the average disclosure in traded municipalities (Tab. 6). The test is not statistically significant (p=0.716) for a level of error of 0.05.

Tab. 5: Descriptive statistics of the quantitative variables

Elements	Sample size	Mean	Std. Deviation	Minimum	Maximum
Disclosure index (DIV 31)	104	0.2809	0.0581	0.1895	0.4793
Municipality size (population)	104	76.542	0.5963	13.659	1883425
Logarithm of assets value	104	12.0608	5.3643	3.087	26.092
Percentage of intangibles in the balance sheet	104	0.5888	0.497	0.01	2.35
Classes of intangible assets presented	104	1.12	0.416	1	7

Source: own

Tab. 6: Mann-Whitney test for the variable Public quotation

DIV 31	Values	N	Mean	Mann-Whitney	Z	Sig.
Public quotation	0-no	93	28.43	91.000	-2.5421	0.716
	1-yes	11	36.00			

Source: own

Supposing that a linear association exists between dependent variable and the set of independent variables, we perform the statistical model of multiple linear regression, explaining the behavior of the variable DIV31 according to the independent variables SIZE, ASS, PIBA, CLA and PQUOT.

Multiple linear regression model is the following:

$$DIV\ 31 = \beta_0 + \beta_1 * SIZE + \beta_2 * ASS + \beta_3 * PIBA + + \beta_4 * CLA + \beta_5 * PQUOT + \delta \quad (4)$$

Introducing all the independent variables in the multiple linear regression model, the data obtained are the following (Tab. 7):

Tab. 7: Multiple linear regression

Var	β	t	sig	Results
(constant)	0.276	1.948	0.058	R=0.683
SIZE	0.083	4.624	0.000	R^2=0.468
ASS	0.007	3.540	0.002	R^2Adjusted=0.379
PIBA	0.016	748	0.720	F=6.820
CLA	0.003	1.731	0.087	P=0
PQUOT	3.478E-5	024	0.983	

Source: own

The analysis allow us to conclude that the statistically significant variables obtained from the econometric model are the variable SIZE and ASS, the others being without significant relationship with the dependent variable, because the sig. value associated with them is higher than the significance level of 0.5 ($p>\alpha$). In the regression model, the correlation coefficient (R) is 68.3%, which means a moderate association between the independent variables and the dependent variable. The coefficient of determination (R^2) is 0.468, i.e., the variation in the disclosure index is influenced by the variables SIZE and ASS in 37.9%. Therefore these results validate the hypothesis formulated that the disclosure index is greater in larger municipalities (H1) and the municipalities with the largest value of intangible assets show

a higher disclosure index (H2). This statement is verified by several other studies on disclosure of intangible assets [48], [2], [15].

From the in-depth semi-structured interviews performed with representatives of financial accounting department of Romanian municipalities we found out their awareness about the importance of identification, measurement and disclosure of intangible assets. It was unanimity stated that municipalities accounting practitioners must primary focus on improved reporting of intangibles in a more consistent and comprehensive way. Also new trainings should be welcome to help public sector practitioners to make the best use of intangible assets. Content analysis permitted us to state that there were identified no supplementary measurement ways of intangible assets voluntary disclosed.

Conclusions

Nowadays economies are becoming knowledge based: performance is moving from investment in physical assets to investment in intangible knowledge based assets such as R&D, design, software, and human capital. For many entities investment in such intangibles could equals or exceeds their investment in tangibles such as buildings, office equipment, hardware, machines, and vehicles, if they are properly measured and recognized. Despite the intangibles significance, the present study reveals a low level of interest in their identification, measurement and disclosure in local public sector.

In spite of the accounting rules that establish generally accepted criteria regarding the measurement and evaluation of these intangible assets, subjective factors could come into play, permitting that their value to be manipulated easily, especially for so-called intellectual capital. Subjective evaluation and measurement could generate bad information to stakeholders that is a more significant problem than giving short information.

Besides the accounting approach which faces reticence, the paper pointed out a chronological evidence of the literature as regards both monetary and non-monetary measurement methods of intangible assets which were mostly transposed in the public sector from the private one.

The authors support the idea of three levels as regard the development stages in the process of measurement, recognition and disclosure of full intangible assets.

The paper deals with the analysis of the annual reports of Romanian municipalities to verify the compliance with the requirements of disclosure demanded by accounting rules on intangible assets held by these institutions. In order to do this, a disclosure index was created based on disclosure requirements as stated in IPSAS 31 – Intangible assets and by means of the content analysis technique, information was collected and the financial statements of 104 Romanian municipalities were analyzed.

The global index was obtained by the adding of the OMFP 1917 updated and complement of IPSAS 31 on OMFP 1917 updated items disclosed over the applicable items, resulting in a quantitative dependent variable whose values vary between 0 and 1. The results obtained when the simple linear regression model was applied, confirm that the Size explained by the population number and the logarithm of assets are explanatory variables considered significant. These two combined present an explanatory power of 46.8% of the variation in the disclosure index. Thus, larger municipalities are associated with a greater disclosure of the items required by OMFP 1917 updated and IPSAS 31. The results are compared with those of other studies performed generally in the private sector.

Through the in-depth semi-structured interviews performed we can conclude that municipalities accounting practitioners must primary focus on improved reporting of intangibles in a more consistent and comprehensive way, while they are aware of the intangible assets importance. In order to make the best use of intangible assets new trainings should be welcome to help public sector practitioners. The conclusion is that the intangible assets disclosure index reveals a value of 28.09%, in Romanian municipalities being predominant the software class on the most disclosed intangible assets. Also we concluded that there were identified no supplementary measurement ways of intangible assets voluntary disclosed, although there are presented some characteristics related to intangible assets.

Therefore, we can state that the Romanian municipalities could be classified in the second development stage in the process of measurement, recognition and disclosure of full

intangible assets.

While the most common reason for measuring and reporting the intangible assets is to improve internal performance, i.e. management control., the improvement of the measuring and disclosure of intangible assets is a goal. In the New Public Management Era we can state that the municipalities of the future need to have tools to monitor their progress, being the most effective agents of "mindware".

References

[1] AAA FINANCIAL ACCOUNTING STANDARDS COMMITTEE. Implications of Accounting Research for the FASB's Initiatives on Disclosure of Information about Intangible Assets. *Accounting Horizons*. 2003, Vol. 17, No. 2, pp. 175-185. ISSN 1558-7975.

[2] BOESSO, G., KUMAR, K. Drivers of corporate voluntary disclosure: A framework and empirical evidence from Italy and the United States. *Accounting, Auditing & Accountability Journal*. 2007, Vol. 20, Iss. 2, pp. 269-296. ISSN 0951-3574.

[3] BONTIS, N., DRAGONETTI, N., JACOBSEN, K., ROOS, G. The Knowledge Toolbox: A review of the tools available to measure and manage intangible resources. *European Management Journal.* 1999, Vol. 17, No. 4, pp. 391-402. ISSN 0263-2373.

[4] BRADLEY, K. Intellectual capital and the new wealth of nations. *Business Strategy Review*. 1997, Vol. 8, Iss. 1, pp. 53-60. ISSN 1467-8616.

[5] BRÜGGEN, A., VERGAUWEN, P., DAO, M. Determinants of intellectual capital disclosure: evidence from Australia. *Management Decision*. 2009, Vol. 47, pp. 233-240. ISSN 0025-1747.

[6] CALU, D.A., PITULICE, I.C., DUMITRU, M., GORGAN, C. Empirical Survey Regarding the Presentation of General Purpose Financial Statements of the Public Sector Entities. *Administraţie şi management public*. 2008, No. 11, pp. 105-120. ISSN 1583-9583.

[7] CINCA, C.S., MOLINERO, C.M., BOSSI, Q.A. The measurement of intangible assets in public sector using scaling techniques. *Journal of Intellectual Capital*. 2003, Vol. 4, Iss. 2, pp. 249-275. ISSN 1469-1930.

[8] COOKE, T.E. Disclosure in the Corporate Annual Reports of Swedish Companies. *Accounting and Business Research.* 1989, Vol. 19, Iss. 74, pp. 113-124. ISSN 0001-4788.

[9] CORMIER, D., AERTS, W., LEDOUX, M.J, MAGNAN, M. Attributes of social and human capital disclosure and information asymmetry between managers and investors. *Canadian Journal of Administrative Sciences*. 2009, Vol. 26, Iss. 1, pp. 71-88. ISSN 1936-4490.

[10] DUTZ, M.A., KANNEBLEY, J.S., SCARPELLI, M., SHARMA, S. *Measuring intangible assets in an emerging market economy: An application to Brazil*. Policy research working paper 6142 [online]. The Worldbank, c2012 [cit. 2013-10-20]. Available from: http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-6142.

[11] EDVINSSON, L., MALONE, M.S. *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. New York: Harper Business, 1997. ISBN 0-88730-841-4.

[12] EDVINSSON, L., STENFELT, C. Intellectual Capital of Nations – for Future Wealth Creation. *Journal of Human Resource Costing & Accounting*. 1999, Vol. 4, Iss. 1, pp.21-33. ISSN 1401-338X.

[13] ERNST&YOUNG. *A snapshot of GAAP differences between IPSAS and IFRS* [online]. Ernst&Young. 2013, April [cit. 2013-10-20]. 8 p. (PDF). Available from: http://www.ey.com/Publication/vwLUAssets/GAAP_differences_between_IPSAS_and_IFRS/$FILE/IPSAS_vs_IFRS_AU1506.pdf.

[14] GARCIA, J., ALONSO DE MAGDALENO, M.J. *Fair value on commons-based intellectual property assets: Lessons of an estimation over Linux Kernel* [online]. MPRA, c2010 [cit. 2013-10-20]. 25 p. (PDF). Available from: http://mpra.ub.uni-muenchen.de/23680/1/MPRA_paper_23680.pdf.

[15] GERPOTT, T.J., THOMAS, S.E., HOFFMANN, A.P. Intangible asset disclosure in the telecommunications industry. *Journal of Intellectual Capital.* 2008, Vol. 9, Iss. 1, pp. 37-61. ISSN 1469-1930.

[16] HARRIS, I. A Theory of Intellectual Capital. *Advances in Developing Human Resources*. 2000, Vol. 2, No. 1, pp. 22-37. ISSN 1552-3055.

[17] IPSAS 31. *Intangible assets* [online]. IFRS Publications Departmen, c2010 [cit. 2013-10-26]. 55 p. (PDF). Available from: https://www.ifac.org/sites/default/files/publications/files/ipsas-31-intangible-assets-2.pdf.

[18] IPSASB Meeting. *Conceptual Framework for General Purpose Financial Reporting by Public Sector Entities: Elements and Recognition on Financial Statements* [online]. Toronto, 2013 [cit. 2013-10-20]. pp. 54 (PDF). Available from: www.ifac.org/sites/default/.../Agenda%20items%202A%20combined.pdf.

[19] ITTNER, C., LARCKER, D. Are non-financial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research*. 1998, Vol. 36, pp. 1-35. ISSN 1475-679X.
[20] JOSE, M., UBHA, D.S., SIDHU, J.L. Disclosing intellectual capital in annual reports from Australian S/W & I/T corporations. *Journal of Knowledge Management Practice*. 2010, Vol. 11, Iss. 3, pp. 1-19. ISSN 1705-9232.
[21] KENNEDY, T.M. *Critical evaluation of the potential of stakeholder theory to contribute to understanding of large-scale public service IT projects and their implementation* [online]. San Francisco (CA): Academia.edu, c2013 [cit. 2013-10-20]. 10 p. Available from: http://www.academia.edu/4249142/Critical_evaluation_of_the_potential_of_stakeholder_theory_to_contribute_to_understanding_of_largescale_public_service_IT_projects_and_their_implementation.
[22] KEONG, K. Intellectual capital: definitions, categorization and reporting models. *Journal of Intellectual Capital*. 2008, Vol. 9, Iss. 4, pp. 609-638. ISSN 1469-1930.
[23] KONG, E., PRIOR, D. An intellectual capital perspective of competitive advantage in nonprofit organizations. *International Journal of Nonprofit and Voluntary Sector Marketing*. 2008, Vol. 13, Iss. 2, pp. 119-128. ISSN 1479-103X.
[24] KRSTIĆ, J., ĐORĐEVIĆ, M. Financial reporting on intangible assets: Scope and limitations. *Facta universitatis. Series Economics and Organization*. 2010, Vol. 7, No. 3, pp. 335-348. ISSN 0354-4699.
[25] LAMBERT, R.A. Customer satisfaction and future financial performance. Discussion of: Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research.* 1998, Vol. 36, pp. 37-46. ISSN 1475-679X.
[26] Law no. 215/2001 on local public administration, published in Official Gazette no. 204 of 23 April 2001, updated.
[27] Law no. 351/2001 on the approval of the National Spatial Plan – Section IV Network Places, published in Romanian Official Gazette, 6 July 2001.
[28] Law no. 500/2002 on Public Finance, published in Official Gazette no. 597 of 13.08.2002, updated.
[29] Law no. 52/2003 on transparency in public administration, published in Official Gazette no. 70 of 3 February 2003.
[30] Law no. 544/2001 on free access to public information, published in Official Gazette no. 663 of 23 October 2001, updated.
[31] MOURITSEN, J., THORBJØRNSEN, S., BUKH, P.N., JOHANSEN, M.R. Intellectual capital and new public management. *The Learning Organisation*. 2004, Vol. 11, Iss. 4/5, pp. 380-392. ISSN 0969-6474.
[32] NAVARRO, J.L.A., LÓPEZ, R.V.R., PEÑA, D.N. A theoretical intellectual capital model applied to cities. *Amfiteatru economic*. 2013, Vol. 19, Iss. 34, pp. 455-468. ISSN 2247–9104.
[33] OLLIER, C.B., CHAVENT, M., KUENTZ, V., WALLISER, E. L'adoption en France des norms IFRS relatives aux incorporels. *Revue Française de Gestión.* 2010, Vol. 207, pp. 93-110. ISSN 0338-455.
[34] OMOYE, S.A. Determinants of Intangibles Assets Disclosure in Annual Report: Evidence from Nigerian Quoted Companies. *International Journal of Asian Social Science*. 2013, Vol. 3, Iss. 5, pp. 1152-1165. ISSN 1911-2025.
[35] Order no. 1917/2005 approving the methodological norms regarding the organization and management of public institutions accounting, chart of accounts for public institutions and its implementing instructions, Document issued by the Ministry of Public Finance, published in Official Gazette no. 1186 of 29 December 2005, updated.
[36] PETTY, R., GUTHRIE, J. Intellectual capital literature review: Measurement, reporting and management. *Journal of Intellectual Capital*. 2000, Vol. 1, Iss. 2, pp.155-176. ISSN 1469-1930.
[37] PRESTON, L.E., POST, J.E. *Private Management and Public Policy. The Principle of Public Responsibility*. Stanford University Press, 2012. ISBN 978-0804783866.
[38] RAMIREZ, Y. Intellectual capital models in Spanish public sector. *Journal of Intellectual Capital.* 2010, Vol. 11, Iss. 2, pp. 248-264. ISSN 1469-1930.
[39] RAMÍREZ, Y., TEJADA, Á., GORDILLO, S. Recognition of intellectual capital importance in the university sector. *International Journal of Business and Social Research.* 2013, Vol. 3, Iss. 4, pp. 27-41. ISSN 2164-2559.
[40] RHODES, R.A.W. Traditions and Public Sector Reform: Comparing Britain and Denmark. *Scandinavian Political Studies*. 1999, Vol. 22, Iss. 4, pp. 341-370. ISSN 1467-9477.
[41] ROSLENDER, R. Accounting for Intellectual Capital: Rethinking Its Theoretical Underpinnings. *Measuring Business Excellence.* 2004, Vol. 8, Iss. 1, pp. 38-45. ISSN 1368-3047.

[42] SCHNIDER, A., SAMKIN G. Intellectual Capital reporting by the New Zeeland local government sector. *Journal of Intellectual Capital*. 2008, Vol. 9, Iss. 3, pp. 456-486. ISSN 1469-1930.
[43] SILVA, M.L.R., RODRIGUES, A.M.G., MUÑOZ DUEÑAS, M.P. Disclosure of intangible assets: an empirical study of financial corporations in the Iberian Peninsula. *Revistas Internacionais*. Salerno, 2012. ISSN 1971-5293.
[44] STOLOWY, H., HALLER, A., International Accounting Disharmony: The Case of Intangibles. *Accounting, Auditing & Accountability Journal*. 2001, Vol. 14, Iss. 4, pp. 477-497. ISSN 0951-3574.
[45] SVEIBY, K.E. *Methods for Measuring Intangible Assets* [online]. Karl-Erik Sveiby, 2007 [cit. 2013-10-20]. Available from: http://www.sveiby.com/articles/ IntangibleMethods.htm.
[46] SVEIBY, K.E. *The invisible balance sheet: key indicators for accounting, control and evaluation of know-how companies* [online]. Stockholm: The Konrad Group, c1997 [cit. 2013-10-26]. 137 p. (PDF). Available from: www.sveiby.com/books/DenOsynligaEng.pdf.
[47] WATTS, R.L., ZIMMERMAN, J.L. Positive Accounting Theory: A Ten Year Perspective. *The Accounting Review*. 1990, Vol. 65, Iss. 1, pp. 131-156. ISSN 1558-7967.
[48] WHITE, G., LEE, A., TOWER, G., Drivers of voluntary intellectual capital disclosure in listed biotechnology companies. *Journal of Intellectual Capital.* 2007, Vol. 8, Iss. 3, pp. 517-537. ISSN 1469-1930.
[49] YARDIMCIOGLU, M. The Risks of Intangible Assets in Financial Statements. *Allied Academies International Conference*, *Proceedings of the Academy of Accounting and Financial Studies*. 2008, Vol. 13, No. 1, pp. 107-112. ISSN 1948-3147.

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Abstract

EMPIRICAL STUDY OF INTANGIBLE ASSETS IN ROMANIAN MUNICIPALITIES

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While economies are becoming more and more knowledge based, investment in intangibles assets becomes important tools for management if they are properly measured and recognized. While the literature states that the economic success is based on the effective utilization of intangible assets, in the public sector there is low level of interest in their identification, measurement and disclosure. In the light of the theoretical evidences, the purpose of our research is to verify the developed stage of intangible assets process in Romanian municipalities as regards the awareness, measurement and disclosure in 2012 annual reports. Also, the paper presents the most influential factors of intangible assets information disclosure. In order to do this, a disclosure index has been created, based on the requirements related to the intangible assets, taking into account the referential of Romanian regulations (OMFP 1917 updated) and International Public Sector Accounting Standards The research is based on content analysis and in-depth interviews methods for collecting data from the 104 Romanian municipalities. The analysis led to the conclusion that the disclosure index of intangible assets is 0.28, where the municipality population and assets are the variables that are considered explanatory of the variation of the disclosure index in the regression analysis performed. There were identified no supplementary measurement ways of intangible assets voluntary disclosed, although the Romanian municipalities present some characteristics related to intangible assets. While management control is more and more important in local public administration, aiming to improve internal performance, the measurement and disclosure of intangible assets becomes a goal.

Key Words: *Identification, measurement and disclosure of intangible assets, factors influencing the intangible assets disclosure.*

JEL Classification: *H11, H83, M41.*

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COMPLEX AGENT-BASED MODELS: APPLICATION OF A CONSTRUCTIVISM IN THE ECONOMIC RESEARCH

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Introduction

Economies constitute complex and dynamic systems, which have been studied from multiple perspectives and with various tools, techniques and methods. They encompass behavioural patterns, interaction among particular subjects, or several functional principles [34]. There are two dominating issues related to modelling of economic systems. Firstly, study of economic systems is traditionally based on analytical and econometric tools, which have been the main arbiters of the veracity or plausibility of assumptions and hypotheses in economics. Theoretical models are usually developed for analytical tractability and offer internal consistency within prescribed conditions and assumptions [28]. This approach is highly suitable for theory development. However, in practice the pace of change and existing uncertainty about the way in which markets will evolve has made it increasingly important for companies to be aware of modelling techniques, which would enable support of decision-making processes. Due to this necessity various modelling tools, methods, or techniques have already been applied in the business realm, ranging from standardised tools and techniques such as Unified Modelling Language (UML) or Petri nets [30], to non-standardised "fun diagrams" helping managers to capture mental models and ideas [5]. Moreover, the pool of applied techniques comprises both models grounded in exact mathematical representation of reality, which can be further simulated (e.g. Markov chains), and more or less vague models helping only to express significant elements and relations in the studied business domain (e.g. flow charts, or causal-loop diagrams). Secondly, majority of these approaches and techniques usually fail when coping with one particular attribute of real economic systems – complexity [6]. These two gaps might be bridged with the help of new modelling paradigms that have been established only recently. Application of agent-based modelling in the realm of economic systems is labelled as Agent-based Computational Economics (ACE). Current ACE research divides into four streams distinguished by objectives [34]:

1) Empirical understanding.
2) Normative understanding.
3) Qualitative insight and theory generation.
4) Methodological advancement.

This paper purpose is to support constructivist approach to economic theory and it aims to apply basic ACE principles in newly developed and original model of a complex economic system. In particular sections it introduces results of experiments run on the created model. As such, it contributes to the second and fourth ACE objectives.

The paper is organised as follows. The literature review focused on ACE and research already done in this realm is provided in the next section. Whereas the third section formulates the research problem, the developed model is depicted in the fourth section. Consequently, experiments conducted for verifying the model validity and usability is described. The sixth section outlines further research directions and possible model extensions. Finally, the discussed issues are concluded in the last section of the paper.

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1. Literature Review

Agent-based modelling is a quite popular modelling approach which is widely used in many disciplines. This approach is characterised by three main tenets [2]:

(i) there is a multitude of objects that interact with each other and with the environment;
(ii) objects are autonomous (hence, they are called agents), no central or "top down" control over their behaviour is admitted; and
(iii) the outcome of their interaction is numerically computed.

Up to date, current scientific papers indexed in recognised scientific databases (ISI Web of Science or Scopus) are classified to tens of research areas. Whereas the majority of research papers belong to the field of computer science or engineering (approximately one third of them); plethora of other application areas such as toxicology, entomology, oceanography, crystallography, management of biological incidents, mobile applications and enterprise, or tourism can be identified [7], [23], [24], [29].

In the economics domain ACE represents relatively new field of study. It is primary based on using of computational power for research and scientific purposes. Thus, the first studies, which were tied with agent-based simulations, were published in the scientific literature in the mid of 1990's [4], [15], [19]. Since then, it has been possible to undertake the first computationally demanding experiments required to model the interactions of a large number of heterogeneous agents with bounded rationality in an economy characterised by non-equilibrium dynamics and information asymmetries [2]. In his study Giaglis [17] concluded that complexity of economic modelling requires application a single, 'holistic' technique that could effectively represent various perspectives in a rigorous and concise fashion, and hence be applicable in all modelling situations. In general, the agent-based modelling enables to develop models with a large number of heterogeneous components, where the emerging dynamics is not known a priori, and outcomes are not trivial and immediately deducible from individual behaviour [8], [37].

In the business and economy realm, the agent-based modelling is applied from the earliest stages of development of this research paradigm. For instance, Janssen and Vries [21] develop a simple dynamic model of the economy-energy-climate system and prove that the adaptive behaviour can be included in global change modelling. Vidal and Durfee [38] use an economic multi-agent system to determine when agent should behave strategically (i.e. learn and use models of other agents), and when it should act as a simple price-taker. Their results show how savvy buyers can avoid being cheated by sellers, how price volatility can be used to quantitatively predict the benefits of deeper models, and how specific types of agent populations influence system behaviour. Trading between buyers and sellers represents a segment of economics which was often selected for application of multi-agent modelling and simulation principles. Systems such as Kasbah [9] or Magma [35] can serve as examples.

Since the first pioneering studies had been published, the application area in the business and economy field was extended. For instance, Babita, Rao and Shukla [1] investigate general possibilities of multi-agent systems in the e-business realm, Guessoum et al. [18] propose a new adaptive multi-agent model that includes the organisational forms into the economic models, or Wilkinson and Young [39] apply agent-based simulation models for identifying and modelling underlying mechanisms and processes in the marketing realm. Damaceanu and Capraru [10] focus their attention on banking market. In their study, they conduct 11 computer experiments and study the evolution of various banking market indicators such as total amount of money, savings, wallets, or bank reserves. Due to its complexity, Sinha et al. [33] studied and created model of petroleum supply chain. Dosi et al. [14] develop an evolutionary model of output and investment dynamics yielding endogenous business cycles. The model describes an economy composed of particular organisations and consumers. Whereas firms belong to two industries, consumers sell their labour and consume their income. Simulation results show that the model is able to deliver self-sustaining patterns of growth characterised by the presence of endogenous business cycles. Desmarchelier et al. [13] (re)assess the relationship between knowledge intensive business services (KIBS) and the economic growth with the help of a multi agent-

based system involving industrial firms, consumer-services firms, consumers, KIBS firms and a banking system. This model helps them to conclude that that KIBS can be regarded as an engine for the economic growth and that they operate as a substitute for the material capital accumulation.

In the field of economics, latest research directions aim at simulating and synthesizing emergent phenomena and collective behaviour in order to understand economic and social systems. Particular topics addressed in scientific journals include artificial markets with heterogeneous agents, multi-agents in economics, experimental economics [36], financial markets with heterogeneous agents [26], non-linear economic dynamics [25], interacting particle systems in economics, markets as complex adaptive systems, or theory and simulation of agent-based models. According to Bargigli & Tedeshi [2], these models have been able to:

- Drop the unrealistic assumptions prevailed in general equilibrium theory.
- Obtain the macroeconomic level through the interaction of agents at the micro level, without imposing either unrealistic representative agents or simple aggregation processes, which only provide a rough, inefficient approximation.
- Allow the existence of an intermediate meso-scale, which also plays a role in describing the economic and financial system.
- Offer a realistic environment that is well suited for studying the out-of-equilibrium transitory dynamics of the economy, as caused by changes in the policy parameters.

Considering all these advantages, it is not surprising that Delli Gatti et al. [12] discuss issues and challenges facing modern macroeconomics and state that there is the necessity to replace the reductionist approach at the heart of mainstream a dynamic-stochastic-general-equilibrium (DSGE) model with an approach rooted on the science of complexity and agent-based modelling. For instance, Lengnick and Wohltmann [27] combine a simple agent-based model of financial markets and a New Keynesian macroeconomic model with bounded rationality via two straightforward channels. They bring a macroeconomic model which enables the endogenous development of business cycles and stock price bubbles. They show that market sentiments exert important influence on the macro-economy, i.e. impulse-response functions [20] of macroeconomic variables become more volatile which makes the effect of a given shock hard to predict. Furthermore, Pegoretti et al. [31] analyse how the structure of social networks affects innovation diffusion and competition under different information regimes. Diffusion is modelled as the consequence of idiosyncratic adoption thresholds, local network effects and information diffusion. The experiments reveal that for example a high social cohesion decreases the probability of one innovation cornering the market, while a low social cohesion also increases the probability of falling into traps of under-adoption.

However, the ACE movement has to cope with issues related to this research paradigm. For instance, ACE modelling requires the construction of dynamically complete economic models. It means that a modeller has to start from initial conditions and the model must permit and fully support the playing out of agent interactions over time without further intervention from the modeller. This completeness requires detailed initial specifications for agent data and methods determining structural attributes, institutional arrangements, and behavioural dispositions. Consequently, there is the difficulty with validating ACE model outcomes against empirical data. ACE experiments provide outcome distributions for theoretical economic systems with explicitly articulated micro-foundations. Mostly these outcome distributions have a multi-peaked form suggesting multiple equilibria rather than a central-tendency form permitting simple point predictions [34]. Then, intensive experimentation must often be conducted over a wide array of plausible initial specifications for ACE models if robust prediction is to be achieved [22].

2. Model Description

2.1 General Characterisation

Although slight extension of application domains and development of more complex models is apparent, the literature review reveals that several main areas can be identified in the business and economics modelling. However, these areas are mostly problem-based focusing on particular issues and their solutions. Thus,

they are inevitably independent from the research perspective and do not allow simulation and analysis of mutual interrelationship that represents typical feature of the real economic systems. Moreover, even though the systemic nature of conducted research is obvious in some cases, several models are still based on the "ceteris paribus" assumption when model analysis and simulations are run. Therefore, effort needs to be focused on mutual connection of the following economic segments and related issues, which individually represent a challenge from both the modelling and business perspective [36]:

1. Logistics – path finding and application of the graph theory; mechanisms of group transport coordination; dynamical route changes.
2. Consumer behaviour – accordance with existing theories in economics; content of the consumer basket and its determinants such as taxing, education, or social level.
3. Production processes (manufacturing) – production chain management; standardisation; achieving a certain quality level with existing technological limitations.
4. Supplying processes – supply chain management; continuity of processes with minimisation of delays; relationship of volume to number of transportation agents.
5. Managerial decision-making and planning – level of autonomy; pricing; decisions related to organisational development.
6. Labour market – education and qualification issues; accordance with existing theories; structural differentiation in an economy.
7. Services – composition of services; influence of consumer utility function; (dis)similarity to tangible products.
8. Representation of environment – maps utilisation; infrastructure; mobility of agents.

The model described below aims at simulation of economic principles and behaviour of subjects, e.g. effective price and quantity setting under specific demand and capacity constraints [32]. Hence, the focus is on trading products and services, and demanding work on a labour market. Virtual economy simulation is similar to the work of Deguchi et al. [11], however, in that representation the entities considered are more specific, producing more complicated net of relations than necessary. On the other hand, trust issues as discussed for example in [16] and similar concerns are not of primary attention in the presented virtual economy. Due to the simplicity and clarity of relations and transparency of design, several service sectors such as banking or governmental sector are not included in the model. Thus, the model represents structured two-sector model of economy described in the macroeconomics.

2.2 Formal Model Structure

The created model comprises four types of agents: a) consumer agent, b) factory agent, c) mining agent and d) transportation agent. In general an agent is described as a vector of eight observed parameters

$$AGENT = (pos, w, k, s, con, e, pro, mob, a) \quad (1)$$

where

- *pos* represents the agent's position in the 2-D Cartesian coordinates during the simulation;
- *w* means wealth with the assumption $w_{agent} >= 0$, i.e. no debts are allowed;
- *s* represents storage capacity, which is any type of container in which material can be saved;
- *con* gives an agent's consumption, in case of consumer agents it represents combination of production manufactured by factory agents, in case of mining and transportation agents it represents consumption of capital required for production, and in case of factory agent it expresses combination of products on inputs and labour;
- *e* stands for efficiency (i.e. technological level in case of factor, mining and transportation agents, and qualification of consumer agents);
- *pro* represents a production function, which represents combination of inputs used by factory and mining agents;
- *mob* gives mobility, i.e. working efficacy of a transport agent; and
- *a* stands for agent's affiliation to a colony (defined below), whereas agent $\rightarrow$ COL that express that each agent belongs to just one colony in the model;

Thus, particular agents are formally described by the following vectors of parameters:

- consumer agent: $C = (pos, a, w, s, con, e_C)$,
- factory agent: $F = (pos, a, w, s, con, e_F, pro)$,
- mining agent: $M = (pos, w, s, con, e_M, pro)$,
- transportation agent: $T = (pos, a, s, con, e_T, mob)$.

Moreover, a colony is added as the fifth type of agent (meta-agent) and has the following parameters

$$COL_{metaagent} = (pos, s, w, cw, CP) \quad (2)$$

where

- *cw* reports the creditworthiness of a colony; and
- *CP* indicates the colony population, i.e. size of the colony in terms of number of agents.

2.3 Detailed Agent Description

Consumer agent embodies the economic entity that consumes products and services (i.e. goods) and offers work. Consumer agents can buy goods based on the wealth they possess. The wealth of a consumer agent is a product of work and qualification (higher qualification results in faster accumulation of wealth). A consumer agent makes a trade-off between investment into higher qualification (e_c) and consumption. The combination of products consumed and the speed of consumption is given by the consumption function. The combination of products forms a pattern of consumption that can be used to divide consumers into three categories. The three categories are low income, middle income and high income consumers. The pattern determines the ratio of goods that the consumer agent is buying. There three types of goods: necessity, normal, luxurious. For example the proportion of goods bought by a low income class consumer might be 70% of necessity goods such as food and basic household services; 20% of normal goods and 10% of luxury goods. The willingness to buy a certain product depends on the stock. The lower the stock of that particular product the higher price is consumer agent willing to pay). In other words, the scarcity increases acceptable price. This principle is corresponding with standard price and demand relationship. The price p_{max} is the amount a consumer is willing to pay when the stock of that product is empty. Conversely, as the stock is close to 100% of the capacity the price approaches zero i.e. the consumer is willing to buy only if the price is very low.

The second type of agent, a factory agent, corresponds with a company in a real economy. Factory agent is responsible for transforming input to output i.e. material and other products to final product that is bought by consumer agent for consumption or serves as a sub-product that is used by another factory agent in its manufacturing processes. The consumption function determines types of materials and their proportions. The production function determines the portfolio of goods produced. Production requires workforce i.e. employing consumer agents. The production depends on the technological level e_F and qualification of the workforce i.e. employed consumer agents e_C. The production equation is as follows:

$$\sum_{i=1}^{n} k_i^{con} x_i + WF \xrightarrow{production} e_C e_F \left(\sum_{j=1}^{m} k_j^{pro} y_j\right) \quad (3)$$

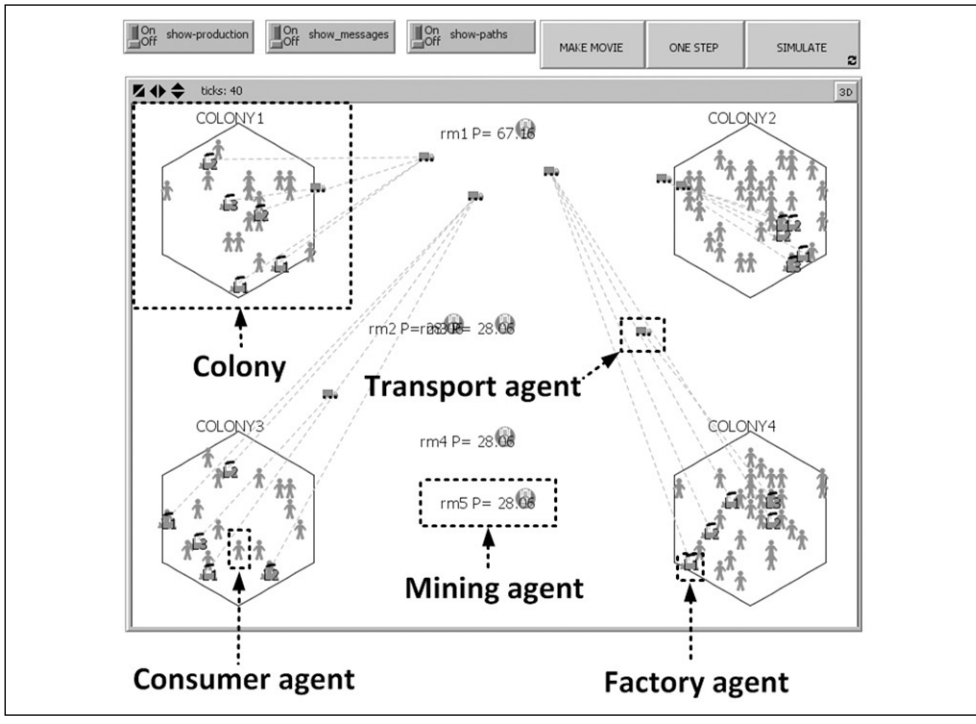
Let k_i^{con} be the speed of consumption of a material x_i and WF is the workforce; e_c is qualification level of a consumer agent and e_F technological level factory agent; k_j^{pro} be the speed of production of a product y_j.

Third type of agent in the model is mining agent. This is agent responsible for transforming resources, located in the environment, into raw materials that are used by factory agents in production of goods. The cost of mining is determined by the consumption function in which the energy and technology necessary for mining is reflected. The function is similar to consumption function of a factory agent. Each mining agent supplies only one type of raw material (if several types of raw materials are produced simultaneously, each is represented by a single specialised mining agent). Raw material, as transformed from resources, is stocked in order to be later sold to transport agents and distributed to processing facilities (i.e. factories) by logistic network.

Transport agents serve as intermediary between mining agents and factory agents. The cost of transportation is given by the distance. There might be barriers or obstacles on the way from mining agent to the factory agent; hence, it is the task of the transportation agent to find a route that is the most economical or otherwise efficient. Different strategies may be used for solving path-finding and distribution problems, e.g. transport agents may co-ordinate

transportation effort with each other in order to achieve maximum efficiency. The performance of a transportation agent is determined by the speed (or mobility), capacity and technological level. Transport agent is a proxy for a particular factory agent. Thus, transport agent does not have any wealth and is buying material on behalf of a factory agent. The technological advancement of a transportation agent is also the same as for the factory agent. Transportation agent is always buying all available material up to the capacity of transportation. Transported material that is not used directly in production is stored in factory agent`s warehouse.

Fig. 1: Prototype of virtual economy in NetLogo



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The modelled virtual economy contains also representation of a society of agents which is called “colony” in this context in order to avoid possible confusion with sociological semantics. The colony consists of consumer, factory and transportation agents. Mining agents do not belong to any colony, as they are distributed throughout the environment, depending on the location of resources they process (see Fig. 1). The colony is characterised by its position in the environment and size of population. Colonies compete for resources that are supposed to be scarce or at least limited. The environment is important for transportation services provided by transportation agents.

The success of a colony can be measured by several factors. The most common efficiency metric is wealth. This metric can be used as default even in case of scenario when no special task is assigned to the colony. The wealth of a colony is given by the sum of wealth of all agents. Due to different colony populations the comparison among colonies requires computing wealth per agent. The formula is as follows:

$$cw_{COL} = \frac{\sum_{i=1}^{n}(w_{C,i}+w_{F,i})+w_{COL}}{p} \qquad (4)$$

where

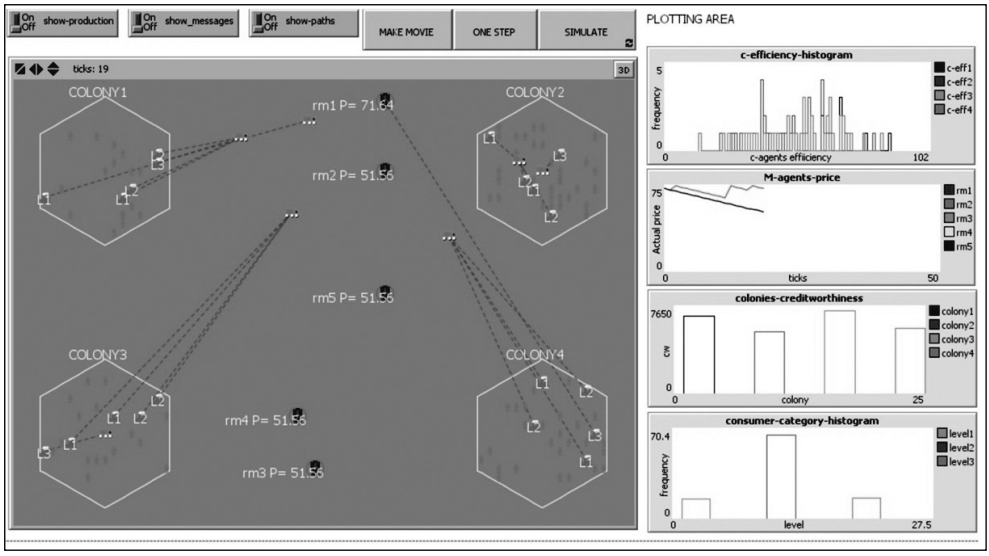
$$p = \sum_{i=1}^{n} c_{COL,i} \quad (5)$$

Scalability and configuration options of the model enable for various configuration and thus for conducting specific experiments. These experiments might be focused on thriving of big colonies with a large population of agents. Other set of experiments might include the competition among colonies in case of a universal resource that cannot be substituted in the production process. Similarly, an interesting experiment might reveal the speed of wealth accumulation in case of one large colony as compared to a number of smaller competing colonies.

2.3 User Interface

The user interface is designed in order to provide maximum transparency of the model. As can be seen at the Fig. 2, the environment representation is situated on the left side of the screen and model output (charts) is on the right side. Control buttons on the top allow switching display of additional information on/off. Individual agent communities are distinguished by colour code. Additional configuration settings for basic model parameters (such as number of colonies, resources, or their location in environment) are also available; however these are not shown at the Fig. 2.

Fig. 2: User interface layout in NetLogo application



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3. Example Scenarios

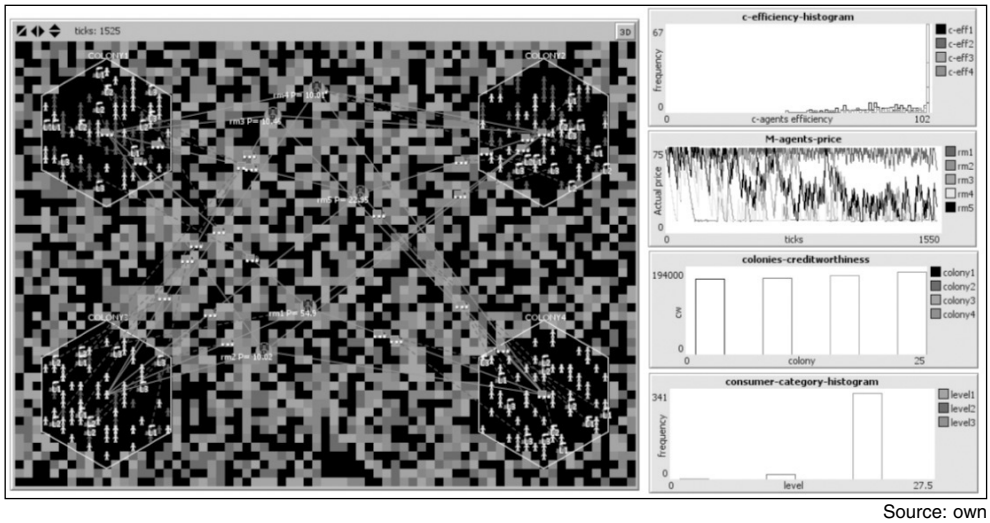
The presented system is already implemented as a prototype version in NetLogo environment and several experiments have been conducted. However, since this platform has certain limits for large scale experiments, full version is intended to be implemented in a more sophisticated environment. Two resource-oriented scenarios showing model behaviour are provided in this section of the text. In both cases the working hypothesis about system's ability to find a solution were tested.

3.1 Example Scenario #1 – Resource Production

In this scenario, the working hypothesis H_0 states that "the created model is capable to capture dynamics of price development when the demand is continuously saturated". There is an M-agent producing one type of material

needed at four colonies of different sizes. Fig. 3 shows user interface used in prototype application with described scenario settings. At the beginning, each colony has certain amount of resources in stockpile in order to survive the initial phase when the production is established. However, when the colony runs out of this stockpile, scarcity of resources will be reflected by increased price of the given commodity. Depending on the type of resource, the scarcity might ultimately result in termination of colony existence (in case of some sort of vital resource, e.g. food) or the production in the colony will be suspended until the supply line is established again.

Fig. 3: Scenario layout



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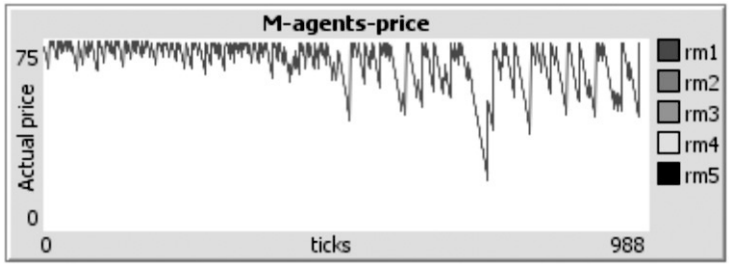
The price chart, shown at the Fig. 4 covers first 1,000 iterations of the model run. During first 500 steps, the agent was unable to produce satisfactory amount of material to satisfy demand of all colonies. The scarcity of this resource is reason why the price holds at high levels during this time. This situation is favourable for the M-agent and it accumulates wealth quickly. This allows it to purchase technological upgrades after approximately 500 steps, allowing it to increase level of production and satisfy more customers. Individual agents are more saturated, and price level drops occasionally (price which customers are willing to pay is derived from the size of their reserve). At this point, M-agent strategy should be adjusted to maximisation of profits, becoming efficiently a price-maker for the given commodity.

Fig. 4: Chart of "rm1" material price in 1000 iterations



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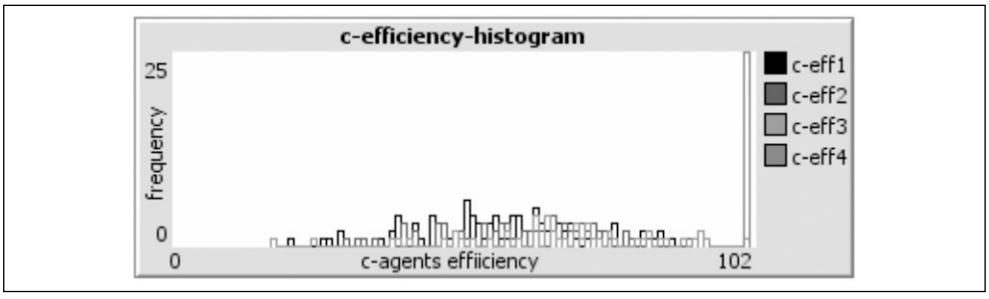
From the colony perspective, the satisfaction level is heavily dependent on its size (i.e. population). In this case, data related to four considered colonies are labelled *c-eff1*, *c-eff2*, *c-eff3*, and *c-eff4* respectively, with size of 100, 75, 50 and 25 agents respectively. Situation is shown at the Fig. 5. Best results are achieved by colony #4, due to its small size (it is easier to satisfy demand of smaller community of agents) where satisfaction has quickly risen to high values. Colony #1 was able to fully satisfy demand of its inhabitants for first 200 steps only (probably also because of some small supply of material in reserve given at the initialisation of the model). This resulted in unsatisfactory saturation of C-agent population (consumers) inside of the colony (which reached even critical levels) in the latter phases of the simulation.

Fig. 5: Satisfaction of inhabitants (C-agents) of four colonies



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It is apparent the hypothesis H_0 is confirmed be the achieved results. There are possible expansions of this scenario which may be considered. There is a question of selection of appropriate strategy for all participants – for example the M-agent may maintain such level of production which maximises its profit for as long as possible. But a new source of material or a competition may be introduced to the model in later phase. New mining facility may be purchased by colonies in order to reduce the price. The idea is to create system able to adapt to changing conditions in the dynamic environment. All this is done autonomously, without intervention of human operator (user).

3.2 Example Scenario #2 – Resource Proximity

This scenario tests the working hypothesis H_0 that "proximity of a critical source influence efficiency of a colony". The production chain is more complex in this case, consisting of five raw materials and three levels of production with eleven products in total (it will not be presented here in detail but rather described as needed). However, the experiment is focused mostly on raw material number 5 (labelled as "rm5" in charts). There are three colonies used in this scenario. In order to allow comparison of effectiveness, *rm5* is near one of them – "Colony #3", see Fig. 6, where the key raw material *rm5* is situated in the upper right quarter. Alternative configuration is shown at the Fig. 7, where *rm5* is situated in the middle of the screenshot.

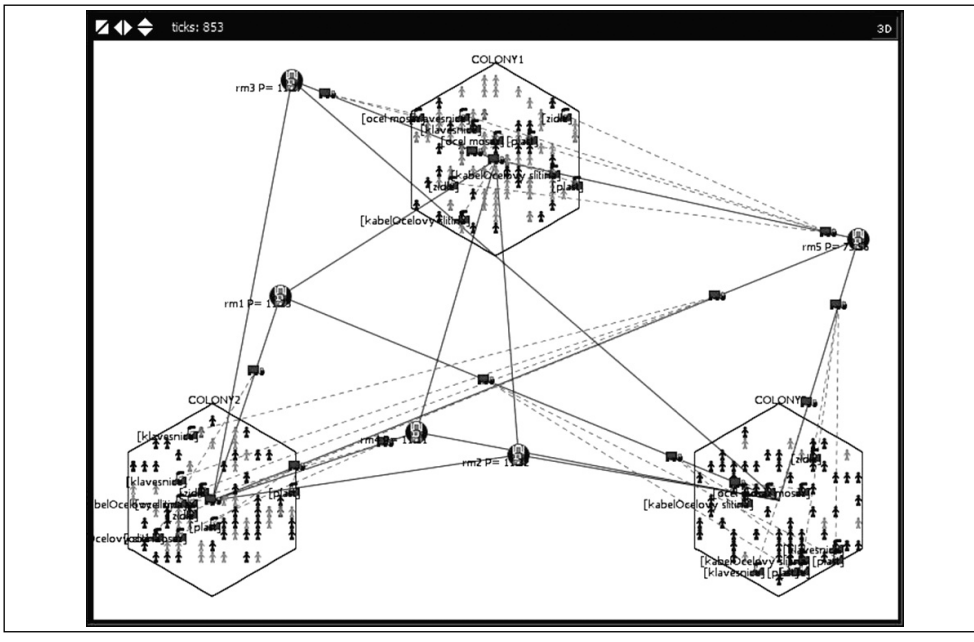
After 1,000 iterations of the model run, there can be seen some similarities in results. The most significant is price of the *rm5* commodity. While other resources tend to lower their price over time, as the demand is gradually more satisfied, price of *rm5* stays high all the time. Also, the overall efficiency of colonies is influenced by the proximity of *rm5* resource. Being the most important resource in the environment, effectiveness of the given colony depends heavily on the distance from it. Other resources have clearly some impact too, but in comparison, it is not so intense.

Two configurations shown at Fig. 6 and 7 are just examples of more extensive testing. After thirty simulation runs, behaviour of the price of *rm5* commodity remains always the same. This leads to following conclusions. The proximity of the critical resource is determining economic dominance in the environment. The

behaviour of the colony should be adaptable to both environment and competition. As soon as the economic dominance is clearly recognised by tendency to achieve high c-efficiency score shown in histogram over long period of time (iterations), typically in correlation with price chart, the colony should re-specialise its production to other type of product. This statement is supported by Fig. 8, where left side shows result related to environment configuration shown at the Fig. 6, whereas the right side is tied to the Fig. 7. Notice similarity in price development "M-agents-price" for "*rm5*" material. Thus, the hypothesis H_0 is confirmed. Moreover, specialisation should be determined by initial conditions of the model, ideally at the beginning of the simulation but even during its run, and the choice regarding specialisation is influenced by these factors:

- Majority of given raw material is in close proximity of the colony.
- Other sources of this resource are insignificant in quantity or distant for competition.
- Production facilities and workforce required for its processing are available to the colony.

Fig. 6: Model environment layout



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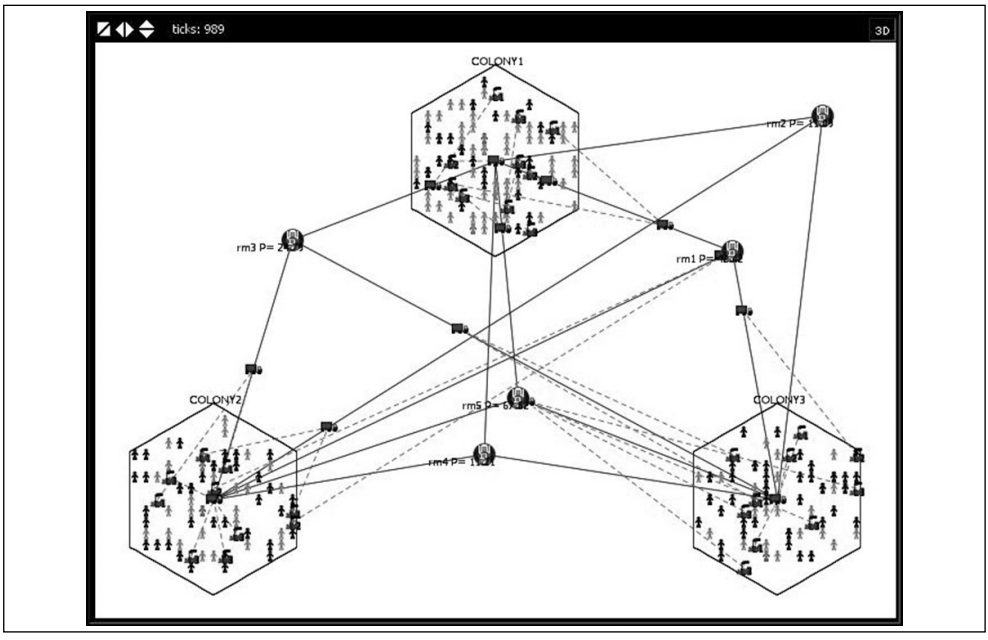
To conclude, colonies should specialise their production according to the initial configuration of the model, capitalizing all the advantage over competition environment may provide. Described factors also allow colonies to autonomously recognise error in judgement even later and eventually re-specialise. In configurations where all colonies use the same production pattern it is a matter of optimisation of workforce allocation. Obtained results will be fully utilised in full version of the model which is being implemented. Nonetheless, they may serve as an example of information which can be used to improve autonomous decision making and effectiveness of agents in the proposed model.

Fig. 7: Another example of model environment layout



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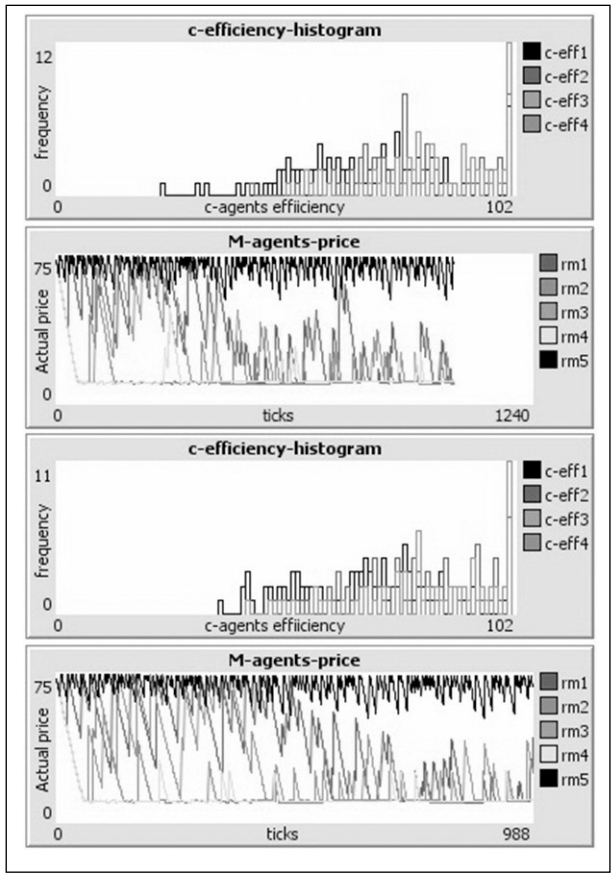
4. Further Development – Collective Perspective

Most of the work done so far was focused on individual agents. On the other hand, group perspective is important as well since a colony is a collection of agents supposed to be working together collaboratively, not just at the same place and in the same time. Behavioural concepts where agent would act simply unselfishly are typically inconsistent with general economic theory since an individual is expected to maximise its own utility. In fact, such concepts would probably have more in common with control mechanisms of insects or other animals, rather than humans [33]. Although the task at hand is not to create a complete real-world simulation but only a simplified model, we would not like to recede too far from reality of human economy.

For this reason individual approach to decision making at the level of a single agent is a requisite. It leads to more autonomous behaviour, which makes models more credible, decentralised and agent-oriented. Moreover, real-world customers are also able to decide on their own course of actions. However, as it was clearly described by Batten [3] in game theory's classical scenario of prisoner's dilemma, it is more efficient to cooperate than to scam each other from the long-term perspective. Since the range of possible actions for individual agents is wide, provided model is designed rationally and is run in several iterations. This leads to conclusion that there should be rules at the community level allowing this collaboration to happen on the scale of the whole group.

In order to narrow possible actions and manipulate agents to work for the benefit of the group as a whole, a set of rules should be established. There might be general ground rules applied in the model such as the following statement: it should be more profitable for the individual agent to follow such rules than to defy them. This actually reflects laws existing in human communities. This does not necessarily means that agents could not break rules at all, but it should only be done rarely. On the other hand, there are also other incentives other than general rules or laws that can be used to

Fig. 8: Comparison of results



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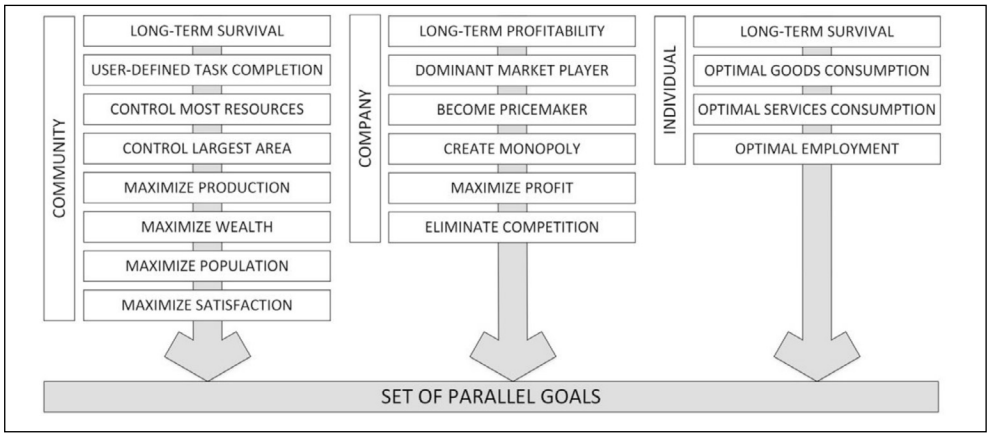
stimulate appropriate behaviour, e.g. financial bonuses, price reduction for services, or more effective community services (such as transportation, infrastructure condition, education, security, etc.). Thus, it is becoming more important to focus more attention on stimuli allowing agent to decide correctly, i.e. according to global (community) goals, corresponding with adopted community policy and priorities. It is natural to expect that under given conditions and with provided information the agent will be doing its own decision rationally, act efficiently and predicatively. But one may ask: what can be considered to be an efficient or rational decision?

The question of "correct" or "proper" decision making is not as complicated as it might seem at the first glance. It only requires approach suitable for machine processing of information. In context of this paper, this requires definition of a global goal in a way which allows mathematical comparison of a new state over previous state(s) of the environment as the simulation develops over time in order to monitor progress in goal pursue. This global goal may be defined by the user, randomly

selected from the set of goals or adopted autonomously by the colony when circumstances require it (like switching manufacturing priority to food production when scarcity of food occurs). In all cases, it must be clearly numerically represented in the form of a variable value.

Although very general metrics to measure efficiency of the system like "colony wealth" described in the equation (4) can be used, the goal definition is important for measuring efficiency of the model on a larger scale. As there is more information and attributes being implemented in the model, the wealth metric is gradually becoming insufficient to cover all important factors contributing to "efficiency". Furthermore, similarly to real-world, there is not only one goal but several goals to be pursued at the same time. As the model becomes more detailed and covers more factors, more goals are to be pursued as well. Examples are depicted in the Fig. 9.

Fig. 9: Examples of parallel goals of agents in the system



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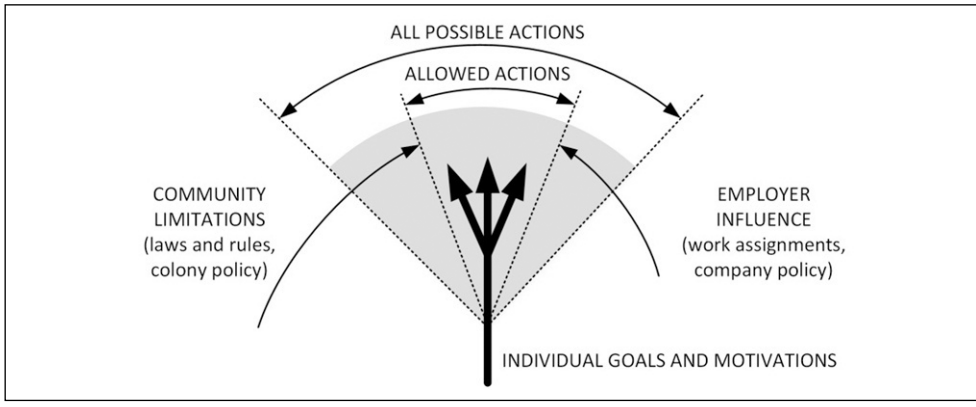
As it can be seen from these examples, goals are to be pursued simultaneously at several levels. Priorities may differ for individual goals according to actual policy. Moreover, all goals are mutually interrelated. Thus, setting of their priorities (weights) and structure of relationships needs to be considered as a further research direction. The task at hand is how to motivate all types of agents to work together efficiently. The solution is in establishing set of constraints which would limit agent`s decision making capabilities to the form which manifests above mentioned parameters – predictability, efficiency, rationality – at both individual and community levels. These constraints can be implemented by two major factors, see Fig. 10.

Inevitable parallelism in goals' pursue leads conclusively to some form of aggregate attribute, representing overall progress and efficiency of any singular agent. In the proposed model, this aggregate attribute is marked as "satisfaction" – which is numerically represented without units of measure. In general, an agent tries to maximise its satisfaction. This concept also allows further expansion of model with new features or in more detail without a need to redesign efficiency measurement system with every new addition.

The most difficult task is proper design and balance of the environment (prices, wages, taxes). For this, we use data provided by Czech Statistical Office, up to the limited (reasonable) extent. This helps us to configure system parameters, but we try to avoid overwhelming complexity which would result from full scale implementation of all data available. Proposed model is to be modular and transparent.

Fig. 10: Constraints for agent`s decision-making



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Conclusions

Modelling of economic systems is tied with economics as an independent discipline from early stages of its formulation. As investigated phenomena had become more comprehensive, usage of various tools and methods was necessary. One of the most current approaches in the field of business and economics modelling is grounded in agent based approaches, which resulted in establishment of Agent-based Computational Economics. In this regard, this paper provides readers with a novel model of economy with two dominant attributes. Firstly, it is theoretically grounded in the ACE paradigm. Secondly, it is complex in its nature and thus not focused merely on selected standard problems solved in the economic research (searching for equilibrium might serve as an example). Depicted model serves as a platform form wide variety of tests and experiments, which can be used for better understanding or verification of both basic economic principles and practical problems. The model proved its validity and reasonability with the help of several experiments, while two resource--oriented tasks are presented in this paper. Modularity of model implementation and transparency of the system allows further model development and incorporation of new features in future.

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References

[1] BABITA, M.J., GOPALA, R.M.V., PURVI, S. The Use of Multi Agent Paradigm to Build an Agent Based Architecture for E-Commerce Application. *Research Journal of Engineering and Technology.* 2011, Vol. 2, Iss. 1, pp. 5-9. ISSN 0976-2973.

[2] BARGIGLI, L., TEDESCHI, G. Major trends in agent-based economics. *Journal of Economic Interaction and Coordination*. 2013, Vol. 8, Iss. 2, pp. 211-217. ISSN 1860-7128.

[3] BATTEN, D.F. *Discovering Artificial Economics*. Oxford: Westview Press, 2000. ISBN 978-0-813-39770-2.

[4] BELEW, R.K., MITCHELL, M. *Adaptive Individuals in Evolving Populations: Models and Algorithms*. Reading: Addison-Wesley, 1996. ISBN 978-0-201-48369-7.

[5] BELL, S., MORSE, S. How People Use Rich Pictures to Help Them Think and Act. *Systemic Practice and Action Research.* 2013, Vol. 26, Iss. 4, pp. 331-348. ISSN 1573-9295.

[6] BUREŠ, V., ČECH, P. Complexity of Ambient Intelligence in Managerial Work. In *ITiCSE 2007: 12th Annual Conference on Innovation and Technology in Computer Science Education - Inclusive Education in Computer Science*. Dundee, United Kingdom, 2007. pp. 325. ISBN 978-1-59593-611-0.

[7] BUREŠ, V., OTČENÁŠKOVÁ, T., ČECH, P., ANTOŠ, K. A Proposal for a Computer-Based Framework of Support for Public Health in the Management of Biological Incidents: the Czech Republic

Experience. *Perspectives in Public Health*. 2012, Vol. 132, Iss. 6, pp. 292-298. ISSN 1757-9139.
[8] ČECH, P., BUREŠ, V. Advanced Technologies in e-Tourism. In *9th WSEAS International Conference on Applied Computer Science (ACS'09)*. Genoa, Italy, 2009. pp. 85-92. ISBN 978-960-474-127-4.
[9] CHAVEZ, A., MAES, P. Kasbah: An Agent Marketplace for Buying and Selling Goods. In: *1st International Conference on the Practical Application of Intelligent Agents and Multi-Agent Technology*. London, United Kingdom, 1996. pp. 75-90. ISBN 0-952-55543-3.
[10] DAMACEANU, R.C., CAPRARU, B.S. Implementation of a Multi-Agent Computational Model of Retail Banking Market Using Netlogo. *Metalurgia International*. 2012, Vol. 17, Iss. 5, pp. 230-236. ISSN 1582-2214.
[11] DEGUCHI, H. et al. Virtual Economy Simulation and Gaming – An Agent Based Approach. *New Frontiers in Artificial Intelligence*. 2001, Vol. 2253, pp. 218-226. ISSN 0302-9743.
[12] DELLI GATTI, D., GAFFEO, E., GALLEGATI, M. Complex agent-based macroeconomics: a manifesto for a new paradigm. *Journal of Economic Interaction and Coordination*. 2010, Vol. 5, Iss. 2, pp. 111-135. ISSN 1860-7128.
[13] DESMARCHELIER, B., DJELLAL, F., GALLOUJ, F. Knowledge intensive business services and long term growth. *Structural Change and Economic Dynamics*. 2013, Vol. 25, Iss. 1, pp. 188-205. ISSN 0954-349X.
[14] DOSI, G., FAGIOLO, G., ROVENTINI, A. The microfoundations of business cycles: an evolutionary, multi-agent model. *Journal of Evolutionary Economics*. 2008, Vol. 18, Iss. 3, pp. 413-432. ISSN 1432-1386.
[15] EPSTEIN, J.M., AXTELL, R.L. *Growing Artificial Societies: Social Science from the Bottom Up*. Cambridge: MIT Press, 1996. ISBN 978-0-262-05053-1.
[16] GAZDA, V., GRÓF, M., HORVÁTH, J., KUBÁK, M., ROSIVAL, T. Agent based model of a simple economy. *Journal of Economic Interaction and Coordination*. 2012, Vol. 7, Iss. 2, pp. 209-221. ISSN 1860-7128.
[17] GIAGLIS, G.M. A Taxonomy of Business Process Modelling and Information Systems Modelling Techniques. *International Journal of Flexible Manufacturing Systems*. 2001, Vol. 13, Iss. 2, pp. 209-228. ISSN 0920-6299.
[18] GUESSOUM, Z., REJEB, L., DURAND, R. Using adaptive multi-agent systems to simulate economic models. In: *3rd International Joint Conference on Autonomous Agents and Multi-agent Systems*. Washington, USA. 2004. pp. 68-75. ISBN 1-58113-864-4.
[19] HOLLAND, J.H. *Hidden Order: How Adaptation Builds Complexity.* Reading: Addison-Wesley, 1995. ISBN 0-201-40793-0.
[20] INOUE, A., KILIAN, L. Inference on impulse response functions in structural VAR models. *Journal of Econometrics*. 2013, Vol. 177, Iss. 1, pp. 1-13. ISSN 0304-4076.
[21] JANSSEN, M., de VRIES, B. The battle of perspectives: a multi-agent model with adaptive responses to climate change. *Ecological Economics*. 1998, Vol. 26, Iss. 1, pp. 43-65. ISSN 0921-8009.
[22] JUDD, K.L. Computationally intensive analyses in economics. In TESFATSION, L., JUDD, K.L. (Eds.). *Handbook of Computational Economics*. Vol. 2. Amsterdam: North-Holland, 2006. pp. 881-893. ISBN 978-0-444-51253-6.
[23] KOZEL, T., MOHELSKÁ, H. Models of firms with mobile oriented architecture. *E+M Ekonomie a Management*. 2010, Vol. 13, Iss. 4, pp. 135-142. ISSN 1212-3609.
[24] KREJCAR, O., JIRKA, J., JANCKULIK, D. Use of mobile phones as intelligent sensors for sound input analysis and sleep state detection. *Sensors*. 2011, Vol. 11, Iss. 6, pp. 6037-6055. ISSN 1424-8220.
[25] LEBARON, B., TESFATSION, L. Modeling Macroeconomies as Open-Ended Dynamic Systems of Interacting Agents. *American Economic Review.* 2008, Vol. 98, Iss. 2, pp. 246-250. ISSN 0002-8282.
[26] LEBARON, B. Agent-Based Computational Finance. In TESFATSION, L., JUDD, K.L. (Eds.). *Handbook of Computational Economics*. Vol. 2. Amsterdam: North-Holland, 2006. pp. 1187-1233. ISBN 978-0-444-51253-6.
[27] LENGNICK, M., WOHLTMANN, H.W. Agent-based financial markets and New Keynesian macroeconomics: a synthesis. *Journal of Economic Interaction and Coordination*. 2013, Vol. 8, Iss. 1, pp. 1-32. ISSN 1860-7128.
[28] MARKOSE, S.M. Developments in experimental and agent-based computational economics (ACE): overview. *Journal of Economic Interaction and Coordination*. 2006, Vol. 1, Iss. 2, pp. 119-127. ISSN 1860-7128.
[29] ODEHNALOVÁ, P., OLŠEVIČOVÁ, K. Agent-Based Simulation of Development Stages of Family Businesses. *E+M Ekonomie*

a Management. 2009, Vol. 12, Iss. 4, pp. 77-83. ISSN 1212-3609.
[30] OUZAYD, F., SAADI, J., BENHRA, J. Proposed simulation models in Medicine drugs circuit with UML and colored petri net: Case Moroccan hospital system. *International Review on Modelling and Simulations*. 2012, Vol. 5, Iss. 1, pp. 497-505. ISSN 1974-9821.
[31] PEGORETTI, G., RENTOCCHINI, F., VITUCCI MARZETTI, G. An agent-based model of innovation diffusion: network structure and coexistence under different information regimes. *Journal of Economic Interaction and Coordination*. 2006, Vol. 1, Iss. 2, pp. 119-127. ISSN 1860-7128.
[32] PENNINGS, E. Price or quantity setting under uncertain demand and capacity constraints: An examination of the profits. *Journal of Economics*. 2001, Vol. 74, Iss. 2, pp. 157-171. ISSN 1617-7134.
[33] SINHA, A.K., ADITYA, H.K., TIWARI, M.K., CHAN, F.T.S. Agent oriented petroleum supply chain coordination: Co-evolutionary Particle Swarm Optimization based approach. *Expert Systems with Applications*. 2011, Vol. 38, Iss. 5, pp. 6132-6145. ISSN 0957-4174.
[34] TESFATSION, L. Agent-Based Computational Economics: A Constructive Approach to Economic Theory. In TESFATSION, L., JUDD, K.L. (Eds.). *Handbook of Computational Economics*. Vol. 2. Amsterdam: North-Holland, 2006. pp. 831-880. ISBN 978-0-444-51253-6.
[35] TSVETOVATYY, M., GINI, M., MOBASHER, B., WIECKOWSKI, Z. MAGMA: An Agent-Based Virtual Market for Electronic Commerce. *Applied Artificial Intelligence*. 1997, Vol. 11, Iss. 6, pp. 501-523. ISSN 1087-6545.
[36] TUČNÍK, P., ČECH, P., BUREŠ, V. Self-organizational Aspects and Adaptation of Agent based Simulation Based on Economic Principles. In SWIATEK, J. et al. (eds.). *Advances in Intelligent Systems and Computing*. Vol. 240. Heidelberg: Springer, 2014. pp. 463-472. ISBN 978-3-319-01857-7.
[37] TUČNÍK, P. Automated Futures Trading – Environment Effect on the Decision Making. In *9th WSEAS International Conference on Applied Computer Science (ACS'09)*. Genoa, Italy, 2009. pp. 74-79. ISBN 978-960-474-127-4.
[38] VIDAL, J.M., DURFEE, E.H. Learning nested agent models in an information economics. *Journal of Experimental and Theoretical Artificial Intelligence*. 1998, Vol. 10, Iss. 3, pp. 291-308. ISSN 1362-3079.
[39] WILKINSON, I.F., YOUNG, L.C. The past and the future of business marketing theory. *Industrial Marketing Management*. 2013, Vol. 42, Iss. 3, pp. 394-404. ISSN 0019-8501.

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Abstract

COMPLEX AGENT-BASED MODELS: APPLICATION OF A CONSTRUCTIVISM IN THE ECONOMIC RESEARCH

Vladimír Bureš, Petr Tučník

The current state in research of economic systems is characterised by two prevailing issues. Firstly, study of economic systems is traditionally based on analytical and econometric tools, which have been the main arbiters of the veracity or plausibility of assumptions and hypotheses in economics. This approach has been proved to be highly suitable for theory development. Secondly, practical issues and necessity to support decision-making led to development of various modelling and simulation techniques or tools. However, majority of these approaches usually fail when coping with complexity. Furthermore, several main areas of interest can be identified in the business and economics modelling. Nevertheless, these areas are mostly independent due to their problem-based focusing on particular issues and their solutions. Depicted gaps might be bridged with the help of new modelling paradigms that have been established only recently. Application of agent-based modelling in the realm of economic systems is labelled as Agent-based Computational Economics (ACE). In particular sections of this paper results of experiments run on the novel model are described. The model is based on agents, which are described as a vector of several observed parameters, and four types of agents are used, namely consumer agent, factory agent, mining agent, and transportation agent. In addition, a colony is added as the fifth type of meta-agent. Scalability and configuration options of the model enable for various configuration and thus for conducting specific experiments. The presented system is already implemented as a prototype version in the NetLogo environment. The paper depicts two example scenarios, resource production and resource proximity, and offers interpretation of achieved results. Since most of the work done so far was focused on individual agents, group perspective as an important extension of ACE modelling is suggested as the further research and development direction.

Key Words: *Multi-agent modelling, agent-based computational economics, NetLogo, resource.*

JEL Classification: *C6, D8, M2.*

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CONCEPT OF THE COMPUTER SCIENCE COURSE AND SOME ASPECTS OF ICT INTEGRATION INTO EDUCATION

Pavel Rosman, Ladislav Buřita

Introduction

In today's dynamic world, there have been major changes in the requirements made on education and professional training. Some branches are emerging and disappearing, and the demand for a certain range of experts is changing. Knowledge is the current source of competitive advantages; managers have to realize that until they don't start managing the knowledge process of their company, they are living in the information economy which is already part of the past. People are being forced to change their specialization and have to study continuously to improve their qualifications.

The paper includes the results of research in teaching Computer Science for Economists (CSE) to prospective economists and managers at the Faculty of Management and Economics (FaME), Tomas Bata University (TBU) in Zlín. It elaborates only on the part of the research goals: to what extent the course meets the expectations of prospective economists and managers for the use in practice and the students result in CSE course. In this paper we raise a question whether students and teachers in tertiary education are adequately prepared to use all the opportunities and approaches leading to effective teaching, particularly in the field of distance learning supported by modern information and communication technology (ICT), which offer new possibilities.

Therefore, we were interested in the student's attitude to this type of education, including their willingness to invest some money in it. As educators, we feel the need to comment on this situation, to address some of the issues and to express our view on this problem of university education. The paper does not cover of all aspects of the tuition CSE at TBU; it presents the basic framework schema of teaching and experience of tutors, result of the research in the education concept and discussion for the father improvement of the CSE.

1. Knowledge Society and ICT Integration in Education: Literature Review

The chapter characterizes the knowledge management in the knowledge society and the aspect of the information and communication technologies (ICT) integration into education. There are mentioned culture and study culture with respect to the ICT using in education process; some ICT tools are described.

1.1 Knowledge Society and Knowledge Management with ICT Support

Towards knowledge society is dependent on exploring its aim and content. It is necessary to initiate the study of knowledge, knowledge strategy preparation and implementation of knowledge management practices. Knowledge is one of the strategic resources of the organization and Its classification has a significant impact on the practical implementation of activities related to knowledge management. The classical division of knowledge into explicit, implicit and tacit can serve as an illustrative example. Knowledge of the various classifications and their use affects the process of creating a knowledge-based strategy. It determines the style of knowledge management that will prevail in the organization. Simultaneous use of several classifications of knowledge at the same time we can

provide a comprehensive approach to knowledge management, which is necessary during the implementation phase. Thus we also solve the long-lasting confrontation between managerial and technological perspective of knowledge management [3].

Because the natural resources and cheap labor force depleted, the developed countries are increasingly focused on commercial exploitation of knowledge and skills of people in organizations. Many companies are beginning to feel that the knowledge of the employees is the most valuable asset. Knowledge management began to reach out to workers as philosophical as well as technological level, as the debate on how knowledge should be managed on a daily basis and used as efficiently as possible. Knowledge management in organizations brings to the company a lot of problems and issues. Reasons to measure the investment in knowledge are many. Among the most important are the efficiency of investments, management and control of personnel and feedback learning. Mapping organizational knowledge is one of the tools for recording and coordination skills. Mapping knowledge flows in contrast to the numerical index includes humans. This mapping obviously has its advantages and disadvantages. Other differences arise from the mapping of explicit and tacit knowledge [15].

The knowledge economy phenomenon raises a number of questions. There are some opinions that it is the beginning of a new global civilization transformation. But also they can meet with a dismissive attitude for which this concept is just old fashion naming to well-known processes. These trends are a source of permanent qualitative transformation of the company, to the capital growth of the use of knowledge capital. Given the transformations that have taken place in the economic environment, businesses are forced to find new methods of management knowledge-capital enterprises which form a significant part of the total capital of the company [2].

The knowledge management in companies is an object of the set of research studies, for example [16]. The crucial factors for companies that want to succeed in the global competition are knowledge and abilities to use the knowledge in the best possible way. With the growing need of knowledge, significance of knowledge management grows, as well as tools of knowledge management in organizations. The research was focused on finding what leads companies to be interested in knowledge management and what phase of its use they find themselves in; the second area was oriented on the corporate environment as a tool for support of acquiring and sharing of knowledge, and the last part of the research was interested in methods and particular procedures used in companies, which could be taken advantage of in connection with the implementation of knowledge management.

As it followed from the research results, the companies are interested in knowledge management, but they come across many obstacles, which finally discourage them from its consistent implementation. Within the horizon of three years, companies plan to deal with knowledge management much more intensively and even to remove potential barriers of its introduction. It can be stated that companies consider knowledge management a significant tool for increasing their competitive ability [16].

Knowledge society is tightly connected with the learning processes, it is mentioned the term of "learning organization" The learning organization is characterized by the active steps in creating new business strategies to be successful and where there is constant communication – training and development give it the competitive edge and individual employee is career resilient. That is why learning is good for both – individual and organization. An organization, which achieves the standard of learning organization, will have employees with positive attitudes because they are seen as a vital ingredient in reaching shared business goals. Learning in the learning organization means active and everlasting learning from own work, work of our colleagues and competitors. Withal it is going especially about the change of corporate culture [14].

During the last decades of the twentieth century, the technological development has brought new means of communication and a global information infrastructure. This infrastructure allows a faster creation, processing, transfer and storage of huge amounts of information. Internet has driven the increase of collaboration, learning and research, electronic commerce and one-click information. Nowadays Internet is the backbone of the new economy, enabling business communication strategies like Business-to-

Business (B2B), Business-to-Customer (B2C), and Business-to-Employee (B2E) [7].

ICT is an important tool for manager's decision support, but it doesn't mean that they are a source of competitive advantage. ICT are mostly part of every system and subsystem inside a company or organization. However, nowadays they are a commodity and no longer a source of competitive advantage. Knowledge is the current source of competitive advantages; managers have to realize that until they don't start managing the knowledge process of their company, they are living in the information economy which is already part of the past. Investment on information technologies has to have a complete strategy of application in a mid-term, otherwise it can be waste of money. Investment on information technologies has to have a complete strategy of application in a mid-term, otherwise it can be waste of money. The new possibilities of easier and faster access to information has changed the way the whole world moves forward, starting from individuals, the way the communicate, the way they buy, the way products are bought, produced and offered and in the end changing societies, markets, companies, etc. [11].

The sociotechnical systems recognized many years ago that organizations functioned most effectively when their social and technological networks were compatible. This is the case exactly with e-learning systems. On the other hand, information systems can focus not only on the internal activities, but also the external ones. They can connect customers or suppliers to the company's database [10]. Regarding the needs of information and data storage, different information systems are commonly known [21].

1.2 ICT Integration in Education Process

Culture is the product of the shared values, beliefs, priorities, expectations and norms that serve to inform the way in which an organization manifests itself to the world. The basic idea of culture, including school culture, is that it consist of shared meanings and common understanding, and this culture is variable from school to school [8].

School culture includes everything in school surroundings that is made by human beings, consisting of tangible items as well as intangible concepts and values. The basic idea of culture including school culture is that it consists of shared meanings and common understanding, and that this culture is variable from school to school. In the Czech Republic the first model of school culture was created by Světlík [22].

This model is being used as a basic model of school culture in courses for headmasters in the Czech and Slovak Republic, too. The model of school culture helps us to understand schools better. We underline that for schools are their mission and their orientation to teaching and learning process (preparing young people for living in present and in future society) very important [9].

Information and knowledge society requires computer and information literate citizens. It is doubly true for university graduates [13]. Without sufficient understanding of the topics, including self-practice examples, the role of the teacher – consultant (resp. a tutor in terms of e-learning courses) is indispensable. Ignoring the learning process while designing and developing e-learning systems leads to management information systems (MIS), which are important in managing educational institutions activities and help educational institutions achieve a mature level of automation, but are not themselves learning-focused systems [5].

Education today is under pressure from various views and reforms, which are often contradictory. Recently, we have accepted many educational models, teaching strategies, teaching concepts and methodologies in the Czech education system [1], [24]. New concepts in much revived and enriched Czech education with introducing useful challenges: personalized learning, the possibility of greater choice and availability of educational materials including study materials for distance learning. At the same time, however, the instruction (not only at universities) rejected numerous well-established methods and techniques [11]. Technological innovations are often considered more important than conceptual changes; and thus teaching becomes dehumanized [7].

An interesting research was oriented at the ICT specialists preparation at Czech universities with respect to the needs of the companies and organizations [6]. The university graduates analysis was focuses on universities effective in the ICT education area and compares their

study programs with requirements of businesses. It describes typical "product" of Czech education process in the area of ICT skills. General conclusions show that majority of graduate bachelors (at about 85%) in the Czech Republic do not have knowledge profile to enter business as qualified employees without expensive additional training. At master level the same applies for at about 40% of graduates. Results from our research confirmed positive trends in education of ICT at universities in the Czech Republic. This is valid for both types of study program (bachelor and master study program). The distance between the student's knowledge and business requirements are smaller. This could be cause for example by advances in the study programs structures and courses that are provided in selected study programs.

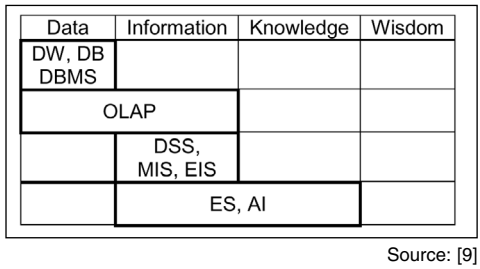
There are examples that the ICT integration in education process was with problems at all levels of education systems. The main focus of the article [18] was on the perceptions of educational practitioners (at the lower secondary level) regarding obstacles that seriously impede the realization of ICT-related goals of schools. The results were from a worldwide survey among national representative samples of schools from 26 countries. The article contains a short summary of the design of this project, a review of main indicators regarding ICT in elementary and lower secondary schools, main obstacles and an exploration of the co-variation between obstacles and contextual factors at the country-level.

ICT is very quickly developed branch that offers for data, information, and knowledge processing the many approaches and tools, see Figure 1 [9]. Data processing is more than 40 years supported by Database Management Systems (DBMS) and education in databases (DB) is a long traditional part of the education not only for the ICT oriented students. The DB-technology failed for the effective decision support and it leads to the Business Intelligence technology (about 20 years ago), supported by Data Warehousing (DW), Online Analytical Processing (OLAP). The institutional result of the decision support offers Managerial IS (MIS) and DSS (Decision Support Systems) for the middle management; for the top management was developed Executive IS (EIS). Priority of knowledge processing is the task the last 20 years, too. There are developed Knowledge Management Systems and Expert Systems (ES) as a part of the Artificial Intelligence (AI). These systems are challenge for the university teacher to bring them into the curricula.

1.3 ICT Tools for Education Support

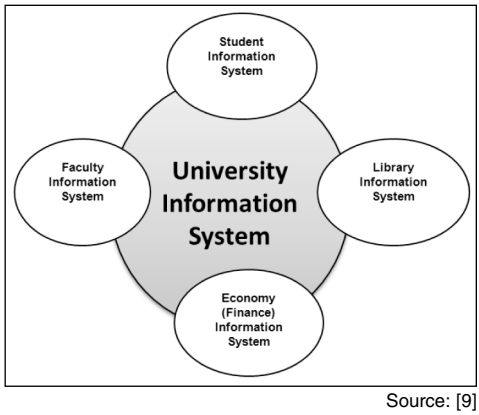
Current university information systems (IS) support data and information processing, sharing and storage; knowledge and wisdom are connected with human action and ethics; and it is precisely it, knowledge, what needs to be managed with the help of ICT, as information is no longer providing a competitive advantage. Learning management systems (LMSs) are responsible for "learning" activities, while university management information systems (UMISs) are responsible for handling University managerial activities. LMSs can't provide the managerial functions needed to support universities, and UMISs don't support the "learning" process [9]. Both systems have to integrate and operate together to support educational institutions and e-learning. Managing universities activities requires a university management information system. UMIS refers broadly to a computer-based system "collection of hardware, software, people, data, and information" that provides managers with the tools for organizing, evaluating, and efficiently running their departments. Examples of UMIS components include a student IS, a librarian IS, a faculty IS, and an economy (finance) system, as illustrated in Figure 2.

Fig. 1: IS focused on internal activities



Source: [9]

Fig. 2: Model UMIS



Source: [9]

Portal technologies are going through time of upheaval in their development. Exponential increases in information and sources on the web require sophisticated portal solutions. Key characteristics of a successful portal and the standard portal services are described in [5], [12]. Elaborated portal solutions which are technologically advanced are essential prerequisites for a website success, but it is always necessary to keep in mind the key aspect of website success which is a customer aspect [2].

Each form of education provides a suitable space for the development of certain styles of learning. Teaching with computers has been employed for a long time. Teaching by e-learning is nothing new either. Personalized education – lessons tailored to a student, adaptable according to theirs qualities is becoming popular. In the long term, a discussion has been held on what kind of content such a course should have [13]. They have been taken in steps of information management that involves information sources and instructions for students, organization of education, communication between lecturers and students, techniques of the student's evaluation and administration of the study results. E-learning as the "learning" process revolution enabled by new technologies that, hopefully, will present an effective and efficient learning process that doesn't exist today. The question of implementing this type of study includes both the availability of adequate technical support, and the already acquired activities that students are involved in, carried out through ICT [11]. E-learning tends to revolutionize and manage the learning process [5], not only to manage universities.

In that process was applied some steps and parts of the information management that involves information sources and instructions for students, organization of education, communication between lecturers and students, techniques of students evaluation and study results administration. The current theory of a learning process is based on theories from the learning process. These processes can be divided into:

- Student's learning processes (processes occurring when the student learns).
- Learning environments (in which climate and environment learning takes place).
- Educational activity of a teacher (co-ordination of learning activities) [19].

The analysis of student's learning styles in included in the articles at the ICTE Conference [5], [9], [13] or in articles [4], [8]. The analysis of teachers' learning styles will be another keystone of defining links between teaching activities and student's learning styles. The task of a teacher is to find a balance in methods and procedures so that each student has the opportunity to develop. The most important task will be to create a learning environment that will promote learning. There is a series of concepts related to teachers' education in the educational literature: teaching style, teaching method, competence, skills, the teacher's approach to teaching, and others [19]. None of the definitions of these terms is accurate enough to be used for the identification and formulation of sub-processes in teaching or even to differentiate between types of teaching styles in relation to student's learning styles [12].

Authors of the paper have been in charge of the CSE course at the FaME for many years. As educators we feel the need to comment this situation, to address some of the issues and to express a view on problem of university education [20]. The key to the improvement of teaching is to explore people's learning styles [8]. If our goal is individualization in teaching, respecting individual particularities of students, we have to make an analysis whether students and teachers in tertiary education are adequately prepared to use all the opportunities and approaches leading to effective teaching, particularly in the field of distance learning supported by modern ICT [12].

2. Research on the Innovation of Approaches to Teaching Computer Science

The Computer Science for Economists (CSE) course might serve as an example, when a whole range of literature is available on the market as well as plenty of interactive courses on the Internet [7]. Although the paper does not cover of all aspects of the CSE course at TBU [24] in favor of enterprise computer science, it presents the basic framework schema of teaching and experience of tutors. Teaching Computer Science responds to the demands of the information society and globalization trends.

The tutors try to improve the course constantly [20], develop the ICT use [12], and thus prepare students in accordance with the requirements of the social environment [4], [20]. To obtain adequate feedback, an extensive research was carried out. It confirmed the correct aiming of the course, but also identified possible areas of improvement. The analysis of the research results makes possible to suggest options for further development of the course. The key to the improvement of teaching is to explore people's learning styles [13]. Let us present the results of the recent research on whether the current form of the CSE fulfils the expectations of the undergraduates.

The research is based on the results of a survey conducted among students of full-time and part-time (combined) form of study at the FaME, TBU in Zlín Based on the evaluation of a questionnaire survey, student opinions on teaching, conducting instruction, approach to testing and ways of examining were gained. The responses were statistically processed, analysed, and will be used to further improve the preparation, content and instruction of the course. The research was carried out at end of semester the academic year 2012/2013.

2.1 CSE Course – Essential Characteristics

The main objective of the course CSE still lies in providing an overview of modern ICT, with regard to all the necessary components of information systems and applications, including their essential characteristics. The aim of the course is to provide students with a recent overview in the field of modern ICT. The course is intended to further broaden the knowledge and skills in the field of ICT [13], especially to consolidate them and reach the level required by the university (students have different levels when entering the FaME, since they come from various types of secondary schools). There is a sustained increase in the number of students in the first year of Bachelor's study programme.

In the 2012/2013 academic year, over 460 students were admitted to the first year of Bachelor's study programme FaME, TBU in Zlín. At the beginning of the semester, the students use the university IS to enroll in courses and chose particular seminars and practical exercises in laboratories. Thus they optimize their own study schedule. The objectives and description of the course are stated on the university portal STAG [23] in the course syllabus including course books. Important study materials, assignments, lectures and seminar topics are posted on the education portal. Students access their study materials in the distance learning courses in the LMS Moodle including important study materials, assignments, lectures, guidelines for exercises in laboratories and seminar topics [24]. Furthermore, students have at disposal a large number of sample documents created in OA, and thus they can compare their products to the standards.

2.2 Methodology of Research and Survey Questionnaire

At the end of the semester in the academic year 2012/2013 a questionnaire survey of the content, form and quality of the CSE course was carried out. The aim was to gain students' opinions on the course and their evaluation, with the intention to improve the CSE teaching in the future [4], [20]. From a methodological point of view was carried out by an anonymous questionnaire survey using the forms (students) and Internet program (part-time students) for the two groups of respondents:

1. Full-time students (290), of which 245 completed the survey.
2. Part-time students (176), of which 84 questionnaires was returned.

The paper questionnaire (Test 1) contained 13 questions. The questions aimed at obtaining the views on the CSE course, thus they pursued a single goal. Up to 11 items were designed as "closed" (dichotomous) questions, with the option to comment on them. One item was a "closed"

(dichotomous) question without any comment and one item was an open question.

The processing of the survey web application (Test 2) was based on the design of Tests 1. The questionnaire contained 14 questions in total; 12 of them were designed as "closed" (dichotomous) questions. The students participated in the research in computer laboratories provided with access to the Internet. The content of the questionnaire was adapted to include questions concerning practical training of full-time students. One question was a "yes/no" question and one was an "open" question. This was ensured by 3 questions; the third of them was a question requiring information about the student's tutor.

The questions were not very demanding; the prerequisite was the attendance at lectures and completion of the assignment. The success of obtaining the completed questionnaire was ensured by the fact that the questions were distributed during the exam. This also influenced the research results because it addressed only the students who attended the course by the examination date. The completion of both questionnaires did not exceed 15 minutes, which is consistent with the theory [17]. The spreadsheet tool was applied to the evaluation of questionnaire (Test 1) and SW tool (Test 2); the aggregation operations (summation, average) were processed and the result charts were created.

The questionnaires within Test 1 and Test 2 were similar in content. Both sought to determine how the students perceived the CSE course instruction. Test 1 was more detailed and offered more open questions. Test 2 included questions about practical training and was designed in a way which forced the students to react to each question; only then were they allowed proceeding further. The preparation of test 2 in the web application form took some extra efforts. On the other hand, the evaluation of the survey including the full-time students was carried out continuously and was easier (it was automated in the application). The evaluation of the survey including part-time students could be commenced only after gathering all the answers and was quite demanding. The credibility of the answers in Test 1 was guaranteed by distributing the questionnaire forms to selected respondents only and collecting them after passing the examination. In Test 2 it was not guaranteed that some respondents did not fill in the questionnaire more than one times.

3. Evaluation of Research

The part-time students were evaluated lecturers, who jointly taught the course. A total of 84 students handed in the questionnaires; 57 students indicated a favorable rating of "satisfied" and "very satisfied" (21), 5 students were "somewhat dissatisfied". There was one case of the "dissatisfied" option. The students expressed reservations about the repetition of certain concepts and terms, then the pace of going through the teaching material, occasionally tedious and boring explanations.

The research into innovation in teaching of the CSE course contains statistics on the responses of individual questions of the questionnaires. In line with the objective of this article, the concern here is to deal with the benefit of lectures to students only. Numerous aspects were evaluated, including comments on the instruction, structure and content of lectures and practical exercises, the attractiveness of presentations, teaching approach, etc. Of the total number of 245 full-time students who filled and handed in the questionnaire, 121 students reported that they were 'satisfied' and 98 students selected the "quite satisfied" option. "Somewhat dissatisfied" was chosen by 19 students and 7 cases of the "dissatisfied" option. Final evaluation compares the results of both tests. The vast majority of students selected a favorable rating of "satisfied" and "very satisfied".

These include the following areas:

- Benefits of lectures to students and the difficulty of the course.
- Quality of the lectures.
- Organization of the course.
- Teacher – student communication.
- Assignments, source materials and the difficulty of the course.
- Testing and examining in the course.

The evaluation of the satisfaction with the course content by the full-time students is shown in Table 1, the evaluation by the part-time students is shown in Table 2. In line with the objective of this article, the concern here is to deal with the benefit of lectures to students only. Numerous aspects were evaluated, including comments on the instruction, structure and content of lectures and practical exercises, the

attractiveness of presentations, teaching approach, etc. The vast majority of students (see statistics) selected a favorable rating of 'satisfied' and 'very satisfied'. Of the total number of 245 students who filled and handed in the questionnaire, 121 students reported that they were 'satisfied' and 98 full-time students selected the "quite satisfied" option. "Somewhat dissatisfied" was chosen by 19 students and 7 cases of the "dissatisfied" option.

Tab. 1: Evaluation of full-time students

Option	Full-time students			
	satisfied	quite satisfied	somewhat dissatisfied	dissatisfied
Quantity	121	98	19	7

Source: own research

Tab. 2: Evaluation of part-time students

Option	Part-time students			
	satisfied	quite satisfied	somewhat dissatisfied	dissatisfied
Quantity	57	21	5	1

Source: own research

Generally, among the most frequent features which gained positive evaluation from full-time students of the CSE course were: open and friendly attitude, ability to explain specialized subject matters in a comprehensive way, clarification of setting important dates, providing all study materials and additional materials in electronic form, professional and outgoing approaches and ability to capture students' attention.

3.1 Subject Areas – Outcomes

In both tests, the benefit of the CSE course subject areas was examined in detail. Individual subject areas were marked; the average mark in test 1 is 1.98 (1.68 is the best and 2.14 the worst one); the average mark in test 2 is 2.27 (1.80 is the best and 2.76 the worst one), see Table 3. The least beneficial subject areas marked by the students were areas 3 and 7; the full-time students identified areas 3, 6, 7 and 8. The subject area which also includes the issues of enterprise computer science earned the average mark of 1.97 by the part-time students and 2.50 by the full-time students. Regarding the fact that lectures at the FaME, TBU are not mandatory, students' attendance was decreasing steadily from almost 100% at the beginning of the course to less than a half. The full-time students lacked motivation to participate in lectures, and therefore they challenged the benefits and importance of the lectures. They expressed more criticism; however, it is vital to state here that they have less or no practical experience in the use of ICT in practice. They have not been able to assess the importance of the course in view of the future needs so far, and thus their marks were lower than the marks suggested by the part-time students.

The most frequent reasons of the quite favorable opinions expressed by the part-time students include: expert knowledge, active approach to teaching, high-quality and rigorous preparation for consultations, professionalism, ability to attract students' attention, sufficient amount of documents and study materials in electronic form, sufficient amount of the information available, including date scheduling and stating clear requirements at the beginning of the semester. Among the objections raised were an absence of practical exercises (which were replaced with practical examples), the range of topics and a small number of consultation hours (earlier 20, now only 10 hours).

3.2 Benefits of Lectures to Students and the Difficulty of the Course

In both tests, the benefit of the CSE course subject areas was examined in detail. Individual subject areas were marked; the average mark in test 1 is 1.98 (1.68 is the best and 2.14 the worst one); the average mark in test 2 is 2.27 (1.80 is the best and 2.76 the worst one), see Table 3. The least beneficial subject areas marked by the students were areas 3 and 7; the full-time students identified areas 3, 6, 7 and 8. The subject area which also includes the issues of enterprise computer science earned the average mark of 1.97 by the part-time students and 2.50 by the full-time students.

Table 3 shows the result of the responses about the importance of the CSE subject areas for students.

Tab. 3: Importance of the CSE subject areas for students

Order	CSE subject area	Part-time students	Full-time students
1	Introduction, CSE placement test	1.68	2.16
2	Computer science as a scientific discipline, basic concepts	1.92	2.41
3	Information and Knowledge Society	2.14	2.76
4	Data, information. Codes and data compression	1.83	2.24
5	Software	1.80	2.27
6	Technical means of data processing	1.98	2.49
7	Computer components	2.13	2.46
8	Information systems and enterprise application software	1.97	2.50
9	Computer networks, Internet and network services on the Internet	1.68	2.00
10	Computer infiltration, malware	1.77	1.80
11	Computer security and data protection, cryptography	1.93	2.08
	Average	1.89	2.27

Source: own research

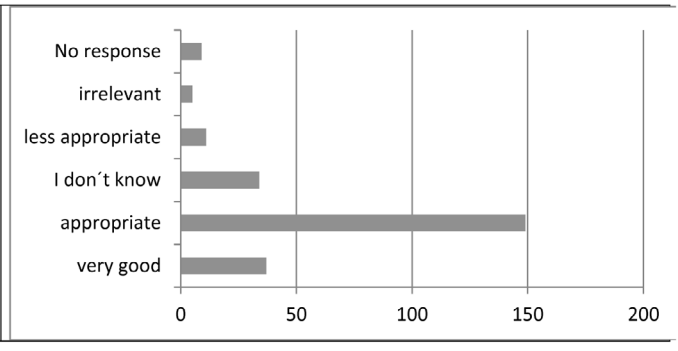
Table 4 shows the result of the responses. The vast majority of students consider the subject's areas appropriate. The question of the appropriateness of the choice of subject areas presented in lectures was assigned to the full-parts students only. The result has met the expectations; it shows a normal distribution in which the peak in the part-time students is shifted to a higher degree of difficulty, which corresponds with the distance from the teaching of ICT (which could not have such a standard and importance in the past as it has now). The difficulty of the course for students in the range from challenging, demanding, mean and easy (scale of A, B, C, D) was assessed as a percentage:

- Part-time students (test 1): 23; 59; 12; 6.
- Full-time students (test 2): 5.5; 31.5; 48; 15.

These measures should make work more effective and facilitate communication between lecturers and students. The knowledge and experience stemming from this research opens up space for more effective implementation of e-learning. The attempt to clarify this confusion is an idea to implement a prototypical e-learning model.

Tab. 4: Importance of the CSE subject areas for full-time students (count of the responses)

Evaluation	Count
1=very good	37
2=appropriate	149
3=I do not know	34
4=less appropriate	11
5=irrelevant	5
no response	9
Total	**245**
Average	**2.07**



Source: own research

4. Questionnaires Evaluation for the Future Course Improvements

The CSE course is intended to further broaden the knowledge and practical skills of students in computer science. Based on the evaluation of both questionnaires and the conclusions that emerged from the respondents' opinions of both forms of studies, the following conclusions and recommendations are suggested:

- To task students, both at practical exercises and seminars, and at lectures.
- To promote autonomy in obtaining necessary information (IS STAG, TBU FaME).
- To update the content of courses continuously and to include more practical examples into lectures to maintain the assessment of course credit work and final test, including testing.
- To communicate important information with appropriate comments already at the introductory lecture and to focus on what is essential and important for the study.
- To stimulate students by raising questions during, tutorials and practical exercises.
- To place emphasis on independent work during practical exercises (full-time form of study) and self-study (part-time form of study).

The teaching should reflect the requirement for getting the ICT skills of students from various schools on the same level, preparing them for work with ICT at the FaME, and enhancing the professionalism of work with ICT for enterprise computer science. Based on the evaluation, it must be regularly to updating the current form of the CSE course. It is important to respect different forms of study (full-time and part-time) and to adapt the content and form of lectures to them to maintain the current organization of the course, including testing and final evaluation of students. The outcomes have brought the following ideas into focus of attention:

1. From the methodological point of view, it is essential to lead and motivate students.
2. Active participation on the side of students is considered a common requirement.

The goal is to make this piece of research available to students and e-learning researchers, so we can together overcome this confusion and start focusing on the "learning" process as the main asset of "e-learning." It is necessary to post the vital and important information on the information sources, where it is accessible and easily obtainable to each student via the internet, and thus to eliminate data redundancy [2], [11].

Conclusion

Knowledge is the current source of competitive advantages; managers have to realize that until they don't start managing the knowledge process of their company, they are living in the information economy which is already part of the past. Although the paper does not cover of all aspects of the CSE course at TBU in Zlín in favor of enterprise computer science, it presents the teaching framework schema and experience of tutor. The next stage of the research will be focused on finding the opinions of the guarantors and educators who are in charge of selected follow-up courses, or the courses which draw upon the above-mentioned course, assuming a certain degree of information competence.

The FaME superiors repeatedly open the debate of whether it is necessary for faculty students to complete the CSE course. They argue that the knowledge and skills students bring from the secondary school. Teachers primarily refer the counter- argument from the experience of teaching (the research described in the article, too) and in particular the statistics of the results in the course, that every year about 40% of the students failed and the trend is still deteriorating. Teachers patiently explain that it is not the pure computer science, but the focus of informatics to support the business, which gives our graduates a competitive advantage.

In addition, the unification of the knowledge and skills of faculty students is a result of the course and students mastering for using ICT in studies and in practice. Progressive trend of our teaching in the CSE course is the transition from the interpretation of ICT components to use of ICT services. Teachers try with the maximum use of the results of educational research to improve teaching and content of the subject CSE.

References

[1] BARTOŠ, P. Základy znalostní ekonomiky. *E+M Ekonomie a Management.* 2006, Vol. 9, Iss. 4. ISSN 1212-3609.

[2] BRDIČKA, B. *Role internetu ve vzdělávání. ICT a kvalita vzdělávání* [online]. 2003 [cit. 2010-05-18]. Available from: http://it.pedf.cuni.cz/~bobr/role/ka92.htm.

[3] BUREŠ, V. Klasifikace znalostí, znalostní strategie a styly znalostního managementu. *E+M Ekonomie a Management.* 2004, Vol. 7, Iss. 1. ISSN 1212-3609.
[4] BUŘITA, L., ROSMAN, P., TEJKL, R. Preparation of economists and managers for enterprise computer science. *Systémová integrace.* 2010, Vol. 17, No. 3, pp 46-56. ISSN 1210-9479.
[5] ČERNÁ, M., POULOVÁ., P. User Testing of Language Educational Portals. *E+M Ekonomie a Management.* 2009, Vol. 12, Iss. 3, pp. 104-116. ISSN 1212-3609.
[6] DOUCEK, P., MARYŠKA, M., NOVOTNÝ, O. Analýza souladu obsahu ICT studijních oborů s požadavky praxe v České republice. *E+M Ekonomie a Management.* 2013, Vol. 16, Iss. 3, pp. 148-161. ISSN 1212-3609.
[7] DRUCKER, P. *Management Challenges for the 21st Century.* New York: Harper Business, 1999. ISBN 08-8730-998-4.
[8] EGER, L. Application of the Corporate Culture in Field of School Management. *E+M Ekonomie a Management.* 2010, Vol. 13, Iss. 3, pp. 26-31. ISSN 1212-3609.
[9] El-GHAREEB, H.A. E-Learning and Management Information Systems: Universities Need Both. *eLearn Magazine* [online]. 2009, No. 9 [cit. 2014-03-18]. Available from: http://elearnmag.acm.org/featured.cfm?aid=1621693.
[10] GÁLA, L. a kol. *Podniková informatika.* 2. vyd. Praha: Grada Publishing, 2009. pp. 226-231. ISBN 978-80-247-2615-1.
[11] JIRKOVSKÝ, J., et. al. Role moderních technologií v současné společnosti. In *Současnost budoucnost krizového řízení.* Praha: T-SOFT, 2007. ISBN 978-80-254-0727-1.
[12] *Konstruktivismus v praxi vysokých škol* [online]. Západočeská univerzita v Plzni, c2013 [cit. 2014-03-18]. Dostupné z: http://www.konstruktiv.zcu.cz.
[13] KRIČFALUŠI, D. New Concept of ICT Development in Education. In *Proceedings Information and Communication Technology in Education.* Ostrava: Pedagogic Faculty, OSU Ostrava, 2009. pp. 42-48. ISBN 978-80-7368-459-4.
[14] KRESLOVÁ, P. Učení v učící se organizaci. *E+M Ekonomie a Management.* 2003, Vol. 6, Iss. 1. ISSN 1212-3609.
[15] KRÝDLOVÁ, B., NOVÁKOVÁ, P., SKALICKÝ, J. Knowledge Management – Theoretical Framework and Practical Research. *E+M Ekonomie a Management.* 2005, Vol. 8, Iss. 1. ISSN 1212-3609.
[16] MAREŠOVÁ, P. Výzkum uplatnění znalostního managementu v českých podnicích. *E+M Ekonomie a Management.* 2010, Vol. 13, Iss. 1, pp. 131-144. ISSN 1212-3609.
[17] PAVLICA, P. a kol. *Sociální výzkum, podnik a management: průvodce manažera v oblasti výzkumu hospodářských organizací.* 1. vyd. Praha: Ekopress, 2000. ISBN 80-86119-25-4.
[18] PELGRUM, W.J. Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education* [online]. 2001, Vol. 37, No. 2 [cit. 2014-01-23], pp. 163-178. Available from: http://www.journals.elsevier.com/computers-and-education/.
[19] ROSENBERG, M.J. *Building successful online learning in your organization.* New York: McGraw-Hill, 2001. 344 p. ISBN 0-07-136268-1.
[20] ROSMAN, P., BUŘITA, L. The Role of Information Management and ICT in University Education. In *Proceedings ICT in Education ICTE'2012.* Ostrava: Pedagogical Faculty, OSU Ostrava, 2012. pp. 31-40. ISBN 978-80-7464-135-0.
[21] SODOMKA, P. *Informační systémy v podnikové praxi.* 1. vyd. Brno: CP Press, 2006. ISBN 80-251-1200-4.
[22] SVĚTLÍK, J. *Marketingové řízení školy.* 1. vyd. Praha: ASPI, 2006. ISBN 80-7357-176-5.
[23] Univerzita Tomáše Bati ve Zlíně. Univerzitní IS STAG [online]. Zlín: Univerzita Tomáše Bati, c2014 [cit. 2014-03-18]. Available from: http://portal.utb.cz/wps/portal.
[24] Univerzita Tomáše Bati ve Zlíně. Studijní portál VÝUKA [online]. Zlín: Univerzita Tomáše Bati, c2014 [cit. 2014-03-18]. Available from: http://vyuka.fame.utb.cz.

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Abstract

CONCEPT OF THE COMPUTER SCIENCE COURSE AND SOME ASPECTS OF ICT INTEGRATION INTO EDUCATION

Pavel Rosman, Ladislav Buřita

The paper summarizes the experience of teaching Computer Science for Economists (CSE) course at the Faculty of Management and Economics (FaME) at Tomas Bata University (TBU) in Zlín. The paper presents approaches aimed at developing the effectiveness in increasing students' knowledge and analyses just one aspect of the research – the importance of the CSE course for students. It describes methodology and technology support of using information and communication technology (ICT) in teaching full-time and part-time students. The experience of the introduction of new approaches and methods into teaching with the use of ICT is offered. There are mentioned some aspects, connect with the ICT as a knowledge society, knowledge management, learning organisation and education processes, eBusiness, ICT support of business and ICT in education.

The first part of the paper describes the teaching of the CSE course at FaME/TBU. It states the objective, overview of subject areas and methodology of teaching as well as the use of information and communication technologies. The second part contains the results of the research on the CSE course, its importance for students, focusing mostly on enterprise computer science. The tutors try to improve the course constantly, develop the ICT use, and thus prepare students in accordance with the requirements of the social environment.

The analysis of the research results makes possible to suggest options for further development of the course. Although the paper does not cover of all aspects of the CSE course at TBU in favour of enterprise computer science, it presents the basic framework schema of teaching and experience of tutors. The experience of teaching and assessing students' knowledge are summarized. In the future the research will be extended to the guarantors of the subjects building on the results of the ICT teaching.

Key Words: *Computer science, student's evaluation, experience, informatics, research, teaching.*

JEL Classification: *D83, I21, M15.*

DOI: *10.15240/tul/001/2014-3-013*

TRANZITIVNÍ EKONOMIKY: POLITICKÁ EKONOMIE RUSKA, VÝCHODNÍ EVROPY A STŘEDNÍ ASIE

Autoři: Martin Myant, Jan Drahokoupil
Nakladatelství: Academia, 2013.

V roce 2013 se do českých odborných knihkupectví dostala kniha autorů M. Myanta a J. Drahokoupila Tranzitivní ekonomiky: politická ekonomie Ruska, východní Evropy a střední Asie, kterou vydalo respektované nakladatelství Academia. Kniha je českou verzí anglicky psaného originálu Transition Economies: Political Economy in Russia, Eastern Europe, and Central Asia vydaného v roce 2011 nakladatelstvím John Wiley & Sons (překlad tým prof. M. Žáka).

Publikace nabízí ucelený pohled na průběh transformačního procesu ekonomik v makroregionu bývalého východního bloku. Autoři zajistí pozornost čtenáře hned v úvodu knihy, kdy vcelku netradičně (minimálně v místním pojetí strukturace knih a článků), ale velmi zajímavě a funkčně, nabídnou „závěrečný účet" transformačního procesu. Bez ohledu na možnost, že některé závěry by v akademickém v akademickém prostředí mohly být předmětem polemiky, je třeba ocenit sílu autorů a jejich schopnost formulovat jasná nealibistická stanoviska. Vlastní text autoři začínají vstupní syntetickou charakteristikou fungování státního socialismu. Tuto pasáž ocení zejména mladší ročníky čtenářů, kteří nemají reálnou zkušenost se životem v této době. Následuje hlavní předmět zájmu publikace a to detailní postižení specifik transformačního procesu v jednotlivých národních ekonomikách v makroregionu. V závěrečné pasáži dali autoři prostor diskusi soudobých vývojových forem kapitalismu i prostorové diferenciaci projevů finanční krize.

Kniha je velmi zdařilým počinem v oblasti poltické ekonomie a ekonomické komparativní analýze v perspektivě národních států. Mezi přínosy díla patří systematická sumarizace poznatků o jednotlivých ekonomikách i formulace jasných hodnotících stanovisek o jednotlivých aspektech jejich vývoje. Text je navíc doplněn velkým počtem grafů a tabulek, které nabízejí v přehledné formě základní data o vývojových parametrech národních ekonomik. Autoři dokonale využívají své pozice extrémně nadstandardně informovaných vnějších pozorovatelů, kdy jejich dlouhodobý výzkumný zájem o území (M. Myant) či soudobé působení v zahraničí (J. Drahokoupil) vytváří ideální podmínky pro nadhled, syntézu a generalizaci. Knihu je nutno primárně doporučit zájemcům z řad odborné veřejnosti, ale způsob pojetí tématu je zvolen tak, dle zvyklostí v anglo-saském prostředí, že může přitáhnout zájem i širších mas čtenářů.

RNDr. Jaroslav Koutský, Ph.D.
Univerzita J. E. Purkyně v Ústí nad Labem
Fakulta sociálně ekonomická

Philippe-Guy NOREL

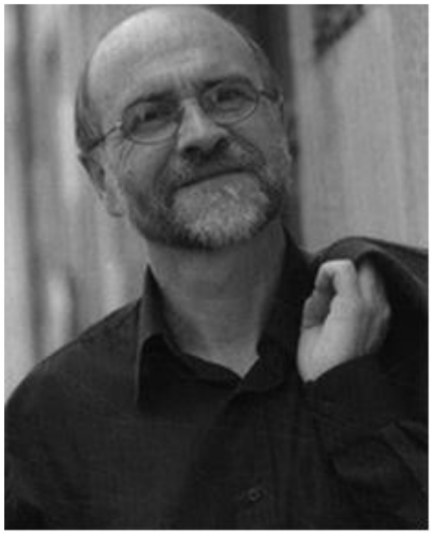
It is with great sadness that we have to inform you that **Philippe-Guy NOREL** passed away on 8th June 2014 at the age of 60. Phillipe Norel studied chemistry and then he decided to focus on economics. After working as a country risk analyst, he obtained a PhD and joined the University of Poitiers in 1991. He occupied various positions within the University. Philippe Norel was in charge of international relations within the department of economics from 2003 to 2013 where he was a respected member of the faculty. He was deeply involved in the University of Poitiers as an assistant to the Dean but also as the director of the recently created Masters' degree program called Globalization and Corporate Strategies. He was also a highly respected researcher, teacher and specialist in the issue of history of globalised economy.

In addition to the University of Poitiers, he lectured on l'Institut d'Etudes Politique de Paris, he participated on the formation of future teachers within the preparation for obtaining diploma Capes de Sciences Economiques et Sociales and in this context he was also member of national committee.

Since 2005 Phillippe Norel lectured on the Faculty of Economics, Matej Bel University in Banská Bystrica. He contributed to creating common bachelor diploma Droit, Economie, Gestion. Thanks to his engagement, a lot of Slovak students had possibility to obtain university diploma in Poitiers Etudes économiques francophones. Since 2010 he was a member of the scientific board of the journal E+M Economics and Management.

The students who benefited from his lectures and the colleagues who cooperated in the research field with him can prove the remarkable range of his knowledge and deep analytical skills. In spite of this fact, he remained to be modest and serving person who desired to transmit the passion which led himself during his life.

His funeral took place on Saturday 14th June at Poitiers' crematorium.



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Submissions must be in English. The author is responsible for scientific accuracy, originality, and the formal appropriateness of the article. If the submitted article has been published in another journal, it cannot be accepted. The editorial board has the right to refuse publication of the article. We recommend that the author(s) define the thematic field in which the article fits, but the board of editors makes the final decision regarding its positioning.

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Article headline should be written in font size 16 bold capital letters and aligned to the left margin.

The author's name should be written without titles or degrees and in font size 12 bold with a single space, size 10, between it and the text of article.

The text of the article should be divided into chapters. Titles of chapters must be numbered (with the exception of the introduction and conclusion), written in bold type, and arranged from the left margin. It is necessary to follow the format described below:

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Charts and graphs are to be numbered and the references must be in the text. The name of a chart (Tab. 1:) or a graph (Fig. 1:) should be written in font size 10 bold italics, aligned from the left margin and without underlining. Pictures and graphs must be visible and clear even in a black and white version. The source from which the author obtained the material should be written under every chart and graph. Tables and graphs are to be sent as a separate file in MS Excel.

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[2] LOW, CH. and LUNGOVÁ, M. *The ethical approach to private sector property development: A comparison between the UK and the Czech Republic* [online]. Liberec: Technical University of Liberec, 2006 [cit. 2007-07-04]. Available from: http://ndz.hf.tul.cz.

[3] ZÁMEČNÍK, R. Personnel controlling as a part of the management controlling system in an enterprise. *E+M Ekonomie a Management.* 2007, Vol. 10, Iss. 2, pp. 29-36. ISSN 1212-3609.

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