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OBSAH:

THE SUSTAINABLE VALUE APPROACH: AN APPLICATION TO THE ENERGY SECTOR IN FRANCE

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Abstract: *This research applies the Sustainable Value approach to the multinationals of the energy sector in France during the period 2005-2007. The sustainable value widens the classic logic of the performance investment evaluation to the environmental and social resources. The cost of the resource is thus defined by its opportunity cost and the company contribution to the sustainability is expressed in monetary terms.*

Key words: *Sustainable Value, Measure, Opportunity Cost, Benchmark.*

1. Introduction

Companies in a general way and multinationals more particularly are important actors of the sustainable development. The European Commission (EC) translates the principles of the sustainable development on the scale of the company by means of the corporate social responsibility (CSR). The definition of CSR used by the EC reflects a concept "whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" [4].

This ideology breaks with the Friedmanian conception of corporations as a tool of maximization of the ownership returns. There is thus a very real possibility that corporations should in certain cases deviate from profit maximization to pursue ends that are more important from a social point of view. "This does not mean that corporations should abandon profit maximization altogether, in certain cases the efficiency enhancing effects of this pursuit will make them legitimate, but in other cases other interests will take precedence" [16]. " The CSR can be also defined as corporate' contributions to the objectives of the sustainable development and the "global performance" is, in the speeches and the manager literature, a term more and more used to represent this contribution" [3]. Defining and measuring sustainability became more than an academic objective. Corporations must demonstrate how they contribute to the national objectives of sustainability fixed by the government. The problem of measure of corporate contributions to sustainability rises in this context. Formally, the investors and the analysts are interested in the economic capital profitability. However, corporations do not only use economic capital but also environmental and social resources to create a return. Thus, it is necessary to estimate the use of all the categories of resources to measure the level of corporate contributions to sustainability. The terms as "eco-efficiency" or "triple-bottom-line" express the idea that while trying hard to realize an economic prosperity the decision-makers of organizations have to take into account environmental and social consequences of their companies' activities. However, we notice today that commercial decisions are essentially directed to financial objectives. Our economic activity continues to damage the environment and thus the social capital while we need all these types of resources to create a sustainable value. So, only corporations which take into account all these three types of resources in their decision-making can really contribute to the sustainable development. This research has for objective to study the sustainability at the level of companies. A review of the literature surrounding the area of the measurement of corporate

contribution to sustainability will be the object of the first part. A particular interest will be carried in the sustainable added value as new approach of measure, in the second part of this study. This approach will be object of an empirical application in the big groups of the energy sector in France. Indeed, the energy future is one of the essential problems of the sustainable development and major subject of the company today. The increase of the world energy consumption (+55 % between 2005 and 2030; 1.8 % a year, according to the World Energy Outlook, October 2007), allied to an upper limit announced by the fossil energy resources due to the finitude of the reserves constitutes a global preoccupation at double level. On one hand, the supply of energy is a vital challenge in the companies' functioning and the populations' everyday life. On the other hand, the energy activity (production and consumption) generates a considerable ecological footprint.

2. Sustainability and corporate contributions to the sustainability

Since the earth summit of Rio in 1992, the governments of several countries of the world adopted the sustainable development as national objective. The Brundtland Report defined it as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" [21]. The term sustainability was also popularised. Atkinson (2000) distinguishes between two types of sustainability. A "weak sustainability", according to which all the stocks of capital are substitutable between them. So any loss in one of the stocks can, in theory, be replaced by a surplus in the other forms of stocks. However, the partisans of a "strong sustainability" suppose that there is at least a not substitutable stock and therefore, it is necessary to keep a level of critical stock. For example, the natural assets supply complex and crucial ecological functions for the human life and consequently, we cannot substitute them another category of assets [1].

Although all discussions and decisions about the way of reaching sustainability are led at the national or global economic scale (e.g. Kyoto protocol), an increasing number of discussions and researches study sustainability in the perspective of economic entities (such as industries or companies). However, finding relevant measures for the company sustainability, in a static point of view, is far from being easy. This problem can be resolved by adopting a dynamic vision for the sustainability. « From a society's point of view the interesting question can be thought of in terms of the contribution of a given entity (e.g. business or sector) to sustainability defined in the wider sense (e.g. nation)" [1]. According to the macroeconomic reasoning, at the firm level, the degree of substitutability of three forms resources (economic, natural and social) must also be examined. Therefore, the continuum of contribution of the firm to sustainability extends from a weak level to a high level. A "weak sustainability" supposes that there is no substitutability between the three types of resources and thus requires improving the results in one dimension while keeping the performance of two others at least constant. A "strong sustainability" supposes an unlimited substitutability of the capital which can allow a deterioration of the performance of one dimension so that it is compensated with a better performance in one of the other dimensions.

There are various approaches for measuring corporate contributions to sustainability. The two prevailing approaches are absolute and relative measures [2]. After a brief presentation of these two approaches, we are going to focus on a new approach for measuring corporate contributions to sustainability: the sustainable value added [6].

2.1 Approach of the absolute measures

This approach leaves the principle that the contribution to the sustainability can be estimated by the difference between the advantages created by a company and the internal and external costs engaged for this end. These costs can be diverted from the full cost accounting [12]. According to the absolute measures approach, a company contributes to sustainability, if the advantages exceed the sum of the costs. The result can be called "the net value added" [15] or "the green value added" [1]. The economic performance of a company in terms of value added is adjusted by the external environmental costs caused by the company's economic activity. Or, the costs can be deducted from the advantages only when both columns are expressed by the same unit. It is for that reason that environmental (and social) damages are expressed in monetary term via the concepts of net value added or green value added. From a theoretical point of view, these concepts supply powerful measures for the corporate contributions to sustainability. They translate the requirements of the rule of the constant capital at the macroeconomic level in measures at the micro-economic level. However, certain limits and problems can arise to their application [6]. Indeed, the necessity of expressing the social and environmental damages in monetary terms, limits severely the practical use of the absolute measures [2]. On the other hand, the absolute measures often compare the value created by the company with the environmental and social damages caused. They allow estimating if a company reached a threshold of sustainability, that means if a company is sustainable or not. However, they don't allow determining if the possible maximum of contribution to sustainability was reached. The absolute measures are based on the hypothesis of the full substitutability.

2.2 Approach of the relative measures

The relative measures express the company's contributions to sustainability as the advantages by unit of environmental or social impact and can escape so certain problems of the absolute measures approach. The best example of a relative measure is the eco-efficiency [6]. Today, there are two different uses from the expression eco-efficiency. The first one refers to the reduction of the environmental impacts. The second notion uses the term eco-efficiency to describe the ratio of the value added by the environmental impact (EI) [2]. According to the second notion, Figge and Hahn had appeal to eco-efficiency - and by analogy social efficiency as a ratio, or:

Eco-efficiency = value added / environmental impact added

The value added of a company is defined as the residual value which stays having deducted from the turnover the products and services costs used by the company. The Environmental Impact Added (EAI) represents the sum of all the energies and the streams of materials considered led by the economic activity balanced by their respective harmfulness to the environment. This aggregation is made classifying every broadcast according to its contributions to various environmental problems which are then balanced by their relative harmfulness. The eco-efficiency describes the degree of use of the environmental resources concerning the development of the company economic activity. The partisans of the eco-efficiency demand that improvements in the eco-efficiency strengthen the companies' contributions to sustainability [2]. When we examine the relation between the sustainability and eco-efficiency we can distinguish between weak and strong improvement of the eco-efficiencies [20]. A strong improvement of the eco-efficiency includes an improvement of the economic and environmental performance while a weak improvement of the ratio requires the improvement of one dimension only. The application of the relative measures approach

presents also a number of gaps. Indeed, these measures don't give information about effectiveness. The efficiency informs about the relation between the consequences (e.g. the environmental impacts) and the fixed objective (economic performance). So, the environmental and economic performance of a company, in absolute terms, cannot be determined from the eco-efficiencies' ratios. For example, if a company produces 3€ by ton of CO_2, we cannot neither say how much value the company creates, nor how much CO_2 it emits in absolute terms. The absolute degrees of environmental, social and economic performances are reflected by measures of effectiveness. These measures are necessary for the evaluation of the corporate contributions to sustainability. In fact, the improvement of the eco-efficiency does not guarantee the improvement of the effectiveness [11]. On one hand, a better eco-efficiency could lead to the growth and thus to the greater use of the environmental resources. On the other hand, the environmental resources which are registered thanks to a better eco-efficiency could be used by the other companies which are less eco-effective. It is necessary to underline also that the eco-efficiency does not cover the social aspects [10]. Besides, even if the social aspects are considered by analogy as social efficiency, the relative measures allow only integrating the environmental and social impacts which are expressed in the same unit.

All environmental and social sub-indicators must be balanced and included for obtaining one sustainability indicator (absolute or relative) [19]. Or, it is very doubtful that all the social and environmental impacts can be integrated into a common unit of the environmental and social impact added simultaneously and so be grouped together in a sustainable impact added [2]. The coherence of an integrating measure of performance is, in the instrumental level, very problematic [18].

3. The sustainable value added: a new approach for measuring corporate contributions to sustainability

All the sustainable development' theories agree on the fact that the future well-being is determined by the wealth evolution through time. On a national scale, a commission on the measure of the Economic Performance and the Social Progress was created at the beginning of 2008, on the initiative of the French government. The objective of a sustainable measure is to estimate the contribution to sustainability including economic environmental and social dimensions. This vision applies as well on the scale of the nation as on the scale of the company. The absolute and relative measures of corporate contributions to sustainability examined above are limited. A sustainable measure has to envisage the efficiency and the effectiveness of every three dimensions of sustainability simultaneously. Besides, such measure is supposed indicate if an entity reached the threshold fixed, namely if it contributes to sustainability (if question), and where the resources were attributed to achieve the most high possible level to sustainability (where question). The investors are regularly confronted with a similar situation of decision-making. They have to determine if the advantage of an investment possibility exceeds its costs and, if it is more attractive than the other investment possibilities.

By analogy with the investment decision, a sustainable measure has to make the distinction between direct costs and opportunity costs. Indeed, the investments are only made if they cover their direct expenses and exceed the advantage which could be reached, if the capital was differently surrounded. This reasoning can be also applied to measure companies' contributions to sustainability. Consequently, a sustainable measure should, on one hand, allow deciding, if an entity' resource use is sustainable and if the resource should be completely used. It should also reflect where the resource should be attributed for an optimal use, namely where the resource reaches a maximum surplus by unit of resource. Figge and Hahn [6] represent this

decision situation in a matrix and suggest comparing the environmental and social performances of various companies between them to answer the question where the resources must be assigned to reach the highest contribution possible to sustainability. Figge and Hahn elaborated a based value methodology to estimate the companies' contributions to sustainability: the sustainable value added. This methodology is based on the opportunity cost thinking and a model of three actors.

3.1 Framework of the sustainable value approach

The sustainable value added as the value created moreover, when the global level of the environmental and social impacts is maintained constant [6]. This measure represents the value created in more because a company was more efficient than a benchmark and on the other hand, because the resources were assigned to the company and not to the benchmark. This idea of benchmarking is applied by social rating agencies and the social responsibility index. These bodies proceed generally to comparisons at the level of the same sector to make a classification of companies within the sector according to their social responsibility scores. The benchmark can help to advance in the field of measure of corporate contributions to sustainability [17]. The sustainable value of a company is calculated on the basis of the comparison of the value created by a benchmark using the same set of resources. In other words with the same amount of financial, environmental and social resources used by the company during a given period how much value the benchmark would create. The sustainable value approach is in the heart of the management-based value system. For estimating corporate contributions to sustainability, it is necessary to consider the changes in the environmental efficiency, the changes in the economic growth as well as the changes in the social efficiency. If the economic, environmental and social performances reach at least the level of the performances of the previous period, strong contributions to sustainability are also reached. The opportunity costs of the resources use must be considered in the evaluation of the company contributions to sustainability [6]. The level of the economic output which was not realized because of the resources allocation to the company on the place of the benchmark represents the lost value. This lost value is called: opportunity cost. The sustainable value is based on the opportunity cost thinking which dominates financial markets. To create a value added, an economic entity (company, State or region) uses generally diverse resources (financial but also environmental). Naturally, it's better to use least resources to create higher value. According to the financial logic, the financial market focuses essentially on the economic capital. The objective is to find the best combination between the risk and the profitability of the resource use. This, naturally, goes against the logic of the sustainable value, according to which, an economic entity does not use only an economic capital but also environmental and social resources. Of this fact the only focus on the economic return on capital is insufficient. How can we determine if an economic entity creates some value with its economic, environmental and social resources?

Generally speaking, a value is created if the profitability exceeds the committed costs.

Value = Profitability - Costs.

This formula is fundamental for any evaluation of an entity economic performance. The sustainable value approach spreads this basic rule to the environmental and social resources. The sustainable value approach consists in:

- Determining the value created by the use of such or such environmental, social or economic resource;

- Comparing the profitability of alternative uses of these resources (opportunity Costs): when the same resources are used otherwise how much supplementary value can be created? A value is only created if the profitability exceeds the opportunity costs.

The sustainable value approach is thus:

- Value-based;

- Easy to apply;

- Use the financial markets logic;

- Compatible with the manager's way of thinking.

The only difference is that this approach substitutes various forms and various uses of the capital. A sustainable value allows an integrated evaluation of the use of the economic, environmental and social resources into monetary terms. The sustainable value is inspired by the principle of "strong durability" and measures if a company creates a positive supplementary value (extra value) while making sure that each of its environmental and social impacts are constant. It takes into account the ecological and social efficiencies of the company as well as the absolute level of environmental and social resources consumed (the ecological and social effectiveness). The methodology of calculation of the sustainable value will now be explained through its application to the big multinationals of the energy sector in France.

3.2 Methodology of calculation of the sustainable value: application to the big multinational of the energy sector in France

The sustainable value widens the classic performance evaluation logic of an investment to the environmental and social resources. To create some value, the profitability of the used economic, environmental and social resources has to exceed the cost of these resources. The use of the resources by the company is so compared with the use of the resources by a benchmark. The cost of the resource is thus defined by its opportunity cost and the contribution of the company to sustainability is expressed in monetary terms. This approach allows measuring the contribution of a company to the realization of a normative objective which represents the benchmark (or the reference value).

3.2.1 The energy sector and the choice of indicators "triple-bottom-line"

The first stage of calculation of the sustainable value consists in determining the quantity of resources used by a company during a given year. This study concerns economic, environmental and social resources because sustainable value approach can cover the three dimensions [5; 6; 7; 8 and 9].

"Triple - bottom-line" indicators considered in this study are selected on the basis of the GRI. Indeed according to international KMPG survey (2005), the GRI and the ISO 14001 stay references the most used by the energy groups in their sustainability reporting. "90 % of the reports of the energy sector published in 2006 make reference to the GRI against 29 % in 2002". The standard GRI also answers the French legislation which makes obligation for the companies to give in their management annual report the information onto the way these companies take into account the social and environmental consequences of their activities. Our choice of indicators is also based on the reports of TOTAL, classified "Sector Leader" in the Sustainability Yearbook of SAM. "Triple-bottom-line" indicators are the following ones:

Tab. 1: Economic, environmental and social resources examined

Economic resources	Environmental resources	Social resources
Total assets	Total energy consumption	Staff
Investments	Total water consumption	Women managers
	Waste	
	CO2-emissions	
	SO2-emissions	
	NOx-emissions	

The number of the environmental indicators is the most important. Indeed, the environment remains the main subject for which the calculated data are developed (38 % of indicators) (KPMG Study). These indicators concern essentially greenhouse gas emissions (carbon dioxide, the dioxide of sulfurs and nitrogen oxides) and in a lesser measure, the waste and resources consumptions (water and energy). The communication on greenhouse gases is for bound a lot to the various current local legislations to answer the Kyoto protocol.

To cover the main activities of the energy sector in France, we held a sample of six big groups on the basis of consolidated turnovers in 2007. TOTAL from the "Oil" sector; AREVA, EDF and GDF from the "Utilities" sector; LIQUID AIR and TECHNIP from the "parapetroleum" sector.

We wanted to integrate more social indicators. But we were forced by the availability of the information, the covered perimeter and the unit of measure. Our study of information media (web site, annual report and sustainability report), revealed a clear evolution of the practices of social and environmental reporting as well as a trend towards the harmonization of such information within the energy sector. But an item as "the training" for example was removed from our list of resources because it is expressed by different manners from a group to another one (Average number of training days by employee a year, number of training hours by employee a year, % of employees having done a training course, etc.). The same remark can be made concerning the item "accident". Some information on the other indicators is only supplied for the perimeter France and is not thus joined into this study.

This research concerns the period 2005-2007 to see the evolution of the contributions to the sustainable development of multinationals studied during these last three years. We now go to see which resources (economic or environmental or social) are used in a value-creating way through the application of the methodology of calculation of the sustainable) value.

3.2.2 Methodology of calculation of the sustainable value

The sustainable value measures the value created or lost through the use of the resources by the company in comparison to a benchmark. The stages of calculation of the sustainable value will now be explained and illustrated through the example of the multinational TECHNIP.

Efficiencies of the use of the resources by a company

The first stage of calculation of the sustainable value consists in determining the efficiency of the use of all the economic, environmental and social resources by the company. To do it, the quantity of the used resources is compared with the return generated by the company. We first have to fix an indicator to measure profitability. In this study, we are going to use the

Operating Profit (OP). The efficiency of the use of a resource corresponds to the OP generated by unit of resource used. In 2007, TECHNIP generated 120.33 € of OP by m^3 of water used. A particular attention is granted to the correspondence between the scope of consolidation of the resources consumption and the OP. This research is based on consolidated data.

Efficiencies of the use of the resources by the benchmark

The second stage of calculation of the sustainable value consists in determining the efficiency of the use of all the economic, environmental and social resources by the benchmark. We thus have to define first of all a benchmark. The average efficiency of the sector can be used as benchmark [14]. This research is thus based on the average efficiency of the energy sector such as it is measured by the average efficiency of the six selected multinationals. To dissipate the size effect, the total Operating Profit will be divided by the total amount of resources used in the energy sector in France. The average OP by unit of resource used is thus calculated for all the considered resources. The average efficiency of the water use in the energy sector is 39.087 € by m^3 used.

Does the company use its resources more effectively than the benchmark?

This stage consists in comparing the company resource efficiency to the benchmark efficiency. The difference between both values defines the contribution by unit of resource generated by the company (in more or less) with regard to the average of the sector (the benchmark). This value allows us to determine which one (company or benchmark) use more effectively all the considered resources. The concept of opportunity cost is so used. The resource value is determined by its alternative use (opportunity cost), namely the value which another entity would create by using the resource. As such, TECHNIP generates +81,245-€ by m^3 in comparison with the benchmark.

Value-creating resources / value-destructing resources

The contributions of the various resources considered are calculated by multiplying the difference generated by the company for a given resource by the corresponding quantity of resources consumed. The result shows the value added (positive or negative) of the use of a quantity of resources by the company in comparison to the benchmark. For example, in 2007, TECHNIP used 2.053 millions of m^3 of water. By multiplying this quantity by the value generated by TECHNIP for the water (calculated during the previous stage), we obtain a 166.769 million € of contribution.

Sustainable value created by the use of all the resources

This stage consists in calculating the global contribution of the company obtained by the use of all the considered resources. It is simply a question of adding contributions of the various resources considered. The obtained value constitutes the sustainable value in absolute term. Now, by following the reasoning of the financial analysis, the performance is often correlated to the size. The large-sized companies may use more resources and thus create more sustainable value (positive or negative). So, to be able to compare the groups of the energy sector on the basis of the sustainable value which they create, we have to take into account the size effect. We chose to divide the absolute sustainable value by the turnover. We call the obtained ratio "marginal" sustainable value and it expresses the value that the company created by euro of turnover realized. In 2007, TECHNIP destroys 1.38 € of sustainable value by 100 € of turnover, that is the group realizes a marginal sustainable value of -1.38 %

4. Results

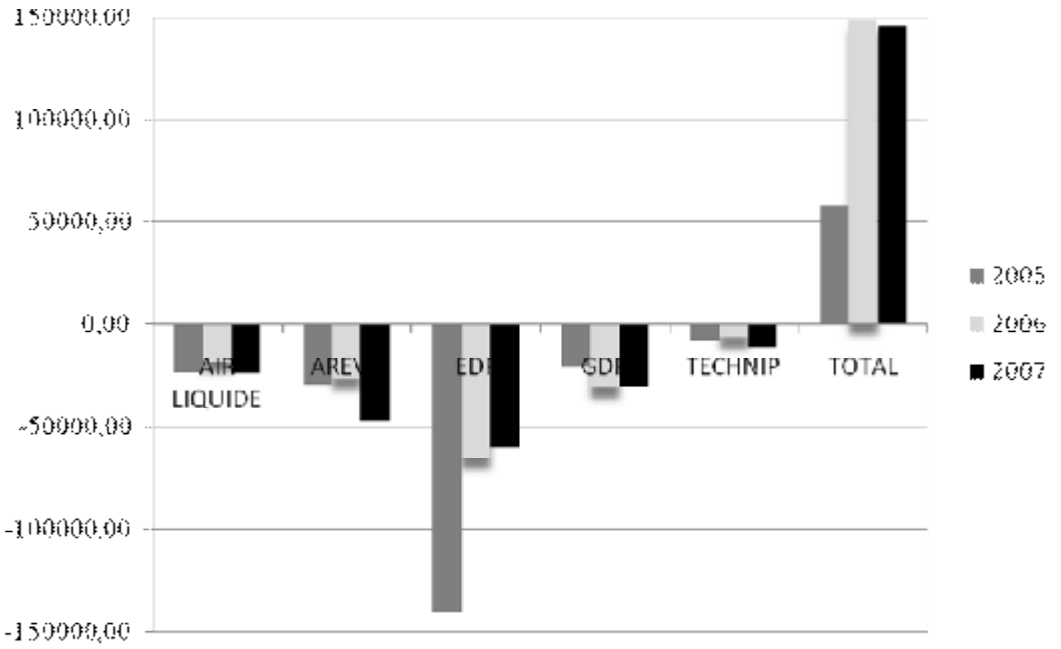
4.1 Absolute sustainable value of the multinational of the energy sector in France

Table 2 below postpones the absolute sustainable values created by the six big multinationals of the energy sector in France during the period 2005-2007. The sustainable value varies between 140.441 billion € (EDF in 2005) and 148.967 billion € (TOTAL in 2006).

Tab. 2: Absolute sustainable value (Billion €)

Compagnies	2005	2006	2007
AIR LIQUIDE	-23331.75	-18273.79	-24378.59
AREVA	-29610.64	-26686.68	-47125.12
EDF	-140441.175	-65613.16	-59828.32
GDF	-21070.20	-31228.53	-30400.15
TECHNIP	-8085.82	-6682.71	-10920.14
TOTAL	57680.66	148967.26	146106.66

It is advisable to indicate that only TOTAL realizes a positive sustainable value during all the period of study (see Picture 1). Besides, the sustainable values realized by EDF improve in the time from 2005 till 2007. However, we notice a fluctuation in the absolute sustainable value of LIQUID AIR, AREVA and TECHNIP who destroy less value in 2006 in comparison to 2005 and destroy more value in 2007. Besides, GDF destroys more value in 2006 and 2007 with regard to 2005. GDF realizes a light improvement in 2007 with regard to 2006.



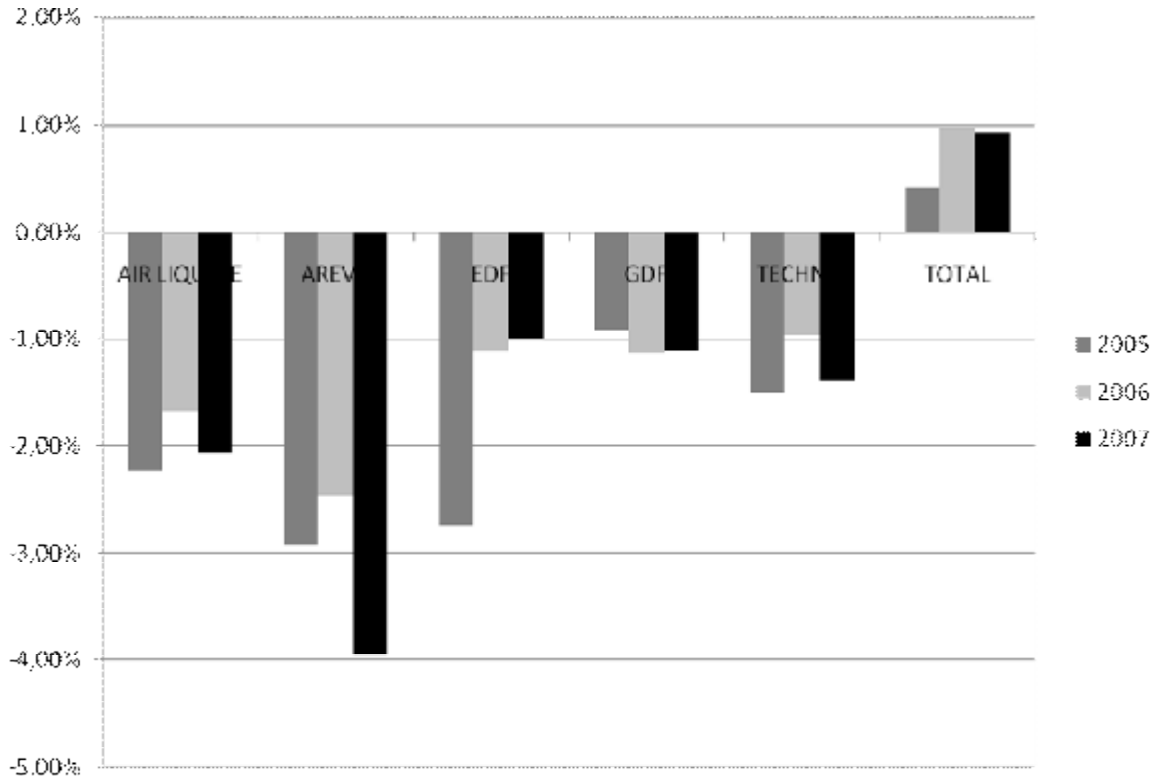
Pict.1: Absolute sustainable value (billion €)

As we evoked it previously, the absolute sustainable value is correlated to the size of the company. We thus had appeal to the calculation of a marginal sustainable value between the absolute sustainable value and the turnover. Table 3 presenting the marginal sustainable values allows a significant comparison of the sustainable values of companies.

Tab. 3: Marginal sustainable values and classification of energy groups

Compagnies	2005	2006	2007	position 05	position 06	position 07
AIR LIQUIDE	-2.24%	-1.67%	-2.07%	4	6	5
AREVA	-2.92%	-2.46%	-3.95%	6	5	6
EDF	-2.75%	-1.11%	-1.00%	5	3	2
GDF	-0.92%	-1.13%	-1.11%	2	4	3
TECHNIP	-1.50%	-0.96%	-1.38%	3	2	4
TOTAL	0.42%	0.97%	0.92%	1	1	1

A comparison with the absolute sustainable value (Picture 1) shows that the positive signs / negative are identical. So the company which uses all resources in a more effective way than sector' average and which realizes in consequences a positive absolute sustainable value, reached by the same a positive marginal sustainable value.



Pict. 2 : Marginal sustainable values

The classification based on the marginal sustainable values shows also that TOTAL is in the first position during the period of study. This multinational generates the highest sustainable value by unit of the turnover, using all resources. The position of GDF based on the marginal sustainable value changes sharply. Indeed, being classified in the third and fourth position respectively in 2005 and 2007 according to the absolute sustainable value, GDF passes in the second position on the basis of the marginal sustainable value. We notice the same effect for EDF. Besides, TECHNIP occupies the second position in 2006; AREVA comes in last position in 2005 and 2007.

The individual results for each of the big groups of energy sector studied will be presented in alphabetical order in appendix (table 4 to 9). Every table contains the contributions of each resource (economic, environmental and social), the sustainable value and the marginal sustainable value, for all the period of study 2005-2007.

The table 4 shows that the group LIQUID AIR realizes a negative sustainable value during the three years. These negative values are essentially due to the negative contributions of the energy consumption, the CO_2-emissions and to the social indicators. Nevertheless, we have to indicate that LIQUID AIR realizes positive contributions with its SO_2- emissions and its assets during all the period and with its NO_x- emissions in 2006 and 2007.

The sustainable value realized by AREVA (table 5) is negative throughout the years of study. As for LIQUID AIR, we notice a light improvement in 2006 with regard to 2005. AREVA is less effective than the benchmark in the use of all its economic and social resources. For the environmental resources, the ineffectiveness gets only the energy and water consumptions. The contributions for the different gas emissions are all positive for every year.

Besides, the sustainable value of EDF improves in the time (table 6). EDF realizes a 1.75-€ improvement by 100 € of turnover from 2005 till 2007. The contributions of all the resources with the exception of the water are negative. Contrary to EDF, the contributions of GDF for water consumption are negative and degrade through time from 2005 till 2007 (table 7). GDF uses its water resources in a much less effective way than the average of the sector. The same remark can be made concerning the energy consumption and the waste generated. Nevertheless, the group GDF seems to manage more effectively than the benchmark its CO_2-emissions. The contribution of NO_x-emissions by GDF improved in the time and it, in passing from a negative value in 2005 to a positive value in increase between 2006 and 2007.

Concerning the group TECHNIP (table 8), although an improvement of the sustainable value (0.55 € by 100 € of Turnover) is realized in 2006, we indicate a degradation in 2007. The contributions of all the resources followed this trend, that is an improvement in 2006 with regard to 2005 and degradation in 2007.

The last one in the list, alphabetically, but the first one in terms of creation of sustainable value is TOTAL. This multinational creates a positive sustainable value every year of the period. An improvement of the absolute and marginal sustainable value was realized in 2006 with regard to 2005. Besides, we notice a light decline in 2007 with regard to 2006. All the resources contributions, with the exception of NO_x-emissions in 2005, are positive. All the resources are thus used more effectively than the average of the sector. These results confirm the place of TOTAL as "leader" in the DJSI Sustainability Index.

5. Conclusion

The sustainable value approach seems to supply interesting results concerning the measure of the sustainability performance of companies and allows comparing companies between them. To improve the future results which can be obtained by such measure, it seems necessary to harmonize indicators used in social and environmental reporting. It is also necessary to encourage companies to develop more quantitative indicators expressed by the same unit and concerning the same perimeter. Our research allows underlining the variety of perimeters and units of measure for some social and environmental indicators. This variety forced us to eliminate these indicators from our study. It is advisable to underline also, the importance to audit and to make verify these indicators to guarantee reliable and useful results for the decision-making.

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Appendix: tables of individual results

Tab. 5: Contributions, sustainable value and marginal sustainable value of **AREVA**

		2005	2006	2007
		Contributions in M €		
Resources	Total assets [M€]	-1856.941	-2313.854	-2721.856
	Investment [M€]	-357.777	-877.983	-4183.915
	Total Energy consumption [GWh]	-260.883	-581.035	-511.390
	Total Water consumption [Mm3]	-1257.516	-442.923	-208.781
	Waste [tons]	-16100.647	-10816.490	-25186.185
	CO2- emissions [Ktons]	215.527	43.497	201.338
	SO2- emissions [tons]	633.332	330.398	481.914
	Nox - emissions [tons]	230.880	339.592	470.433
	Staff	-4340.292	-3861.213	-6768.746
	Women managers	-6516.323	-8506.666	-8697.935
	Sustainable value	**-29610.640**	**-26686.679**	**-47125.123**
	Marginal sustainable value	**-2.92%**	**-2.46%**	**-3.95%**

Tab. 6: Contributions, sustainable value and marginal sustainable value of EDF

		2005	2006	2007
		Contributions in M €		
Resources	Total assets [M€]	-9970.159	-9462.479	-9740.794
	Investment [M€]	-7942.486	-9209.514	798.897
	Total Energy consumption [GWh]	-2526.555	-1523.941	-1195.110
	Total Water consumption [Mm3]	4532.491	7746.994	6770.260
	Waste [tons]	-7719.718	-2378.075	
	CO2- emissions [Ktons]	-917.864	-11604.703	-10980.721
	SO2- emissions [tons]	-5898.589	-15071.852	-14858.720
	Nox - emissions [tons]	-99437.138	-18207.726	-18552.381
	Staff	-6005.453	-1576.203	-7714.877
	Women managers	-4556.280	-4325.658	-4354.871
	Sustainable value	**-14044.750**	**-65613.158**	**-59828.318**
	Marginal sustainable value	**-2.75%**	**-1.11%**	**-1%**

Tab. 7: Contributions, sustainable value and marginal sustainable value of **GDF**

		2005	2006	2007
		Contributions in M €		
Resources	Total assets [M€]	-1370.852	-1637.733	-1020.868
	Investment [M€]	-344.792	676.674	-567.947
	Total Energy consumption [GWh]	-2503.083	-1412.265	-1436.134
	Total Water consumption [Mm3]	-13473.631	-26014.214	-26261.809
	Waste [tonnes]		-8406.760	-5571.206
	CO2- emissions [Ktons]	855.547	2385.432	2550.127
	SO2- emissions [tons]			
	Nox - emissions [tons]	-2465.815	3081.560	3341.875
	Staff	-1767.574	98.777	-1434.192
	Women managers			
	Sustainable value	**-21070.200**	**-31228.529**	**-30400.153**
	Marginal sustainable value	**-0.92%**	**-1.13%**	**-1.11%**

Tab. 8: Contributions, sustainable value and marginal sustainable value of **TECHNIP**

		2005	2006	2007
		Contributions in M €		
Resources	Total assets [M€]	-534.924	-514.108	-611.526
	Investment [M€]	14.046	171.532	-48.339
	Total Energy consumption [GWh]	-7.485	-42.083	-241.290
	Total Water consumption [Mm3]	77.373	247.553	166.769
	Waste [tons]	-5548.963	-5055.377	-7215.858
	CO2- emissions [Ktons]	145.499	256.184	86.304
	SO2- emissions [tons]			
	Nox - emissions [tons]			
	Staff	-1579.718	-1209.296	-2395.712
	Women managers	-651.643	-537.111	-660.493
	Sustainable value	**-8085.815**	**-6682.706**	**-10920.144**
	Marginal sustainable value	**-1.51%**	**-0.96%**	**-1.38%**

Tab. 9: Contributions, sustainable value and marginal sustainable value of **TOTAL**

		2005	2006	2007
		Contributions in M €		
Resources	Total assets [M€]	13027.676	13073.095	13265.654
	Investment [M€]	7372.299	8149.285	5450.257
	Total Energy consumption [GWh]	24110.650	24069.160	25237.639
	Total Water consumption [Mm3]	11822.037	18189.055	19047.136
	Waste [tons]	24133.428	24089.303	25252.248
	CO2- emissions [Ktons]	3038.597	10156.198	9659.257
	SO2- emissions [tons]	-105.062	8298.140	7561.357
	Nox - emissions [tons]	-51685.699	12354.012	12240.019
	Staff	14388.712	17489.967	14537.068
	Women managers	11578.021	13099.046	13856.021
	Sustainable value	**57680.660**	**148967.261**	**146106.655**
	Marginal sustainable value	**0.42%**	**0.97%**	**0.92%**

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A SUSTAINABILITY OVERVIEW OF THE BEST PRACTICES IN THE AIRPORT SECTOR

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Abstract: *This paper refers to the way the sustainable development issues are being addressed by some of those airports that have been considered the best in the world from the perspective of costumers. Firstly, an introduction is given about the rapid growth in this sector in the past few years. Secondly, a special attention is given to the increasing related impacts in the socio-economic and environmental dimensions. Subsequently, a brief introduction about the criteria commonly used for assessing the quality of airport services around the world is provided. Finally, additional criteria regarding the expectations of several stakeholders on sustainability issues is provided and used for investigating the extent to which the acclaimed "best airports" address these issues.*

Keywords: *Airport Sector, Sustainability Reporting, Sustainable Development, Triple Bottom Line.*

1. Introduction

The air passenger transport sector has been in a financial crisis in the past 12 years due to external factors such as the 1997 Asian financial crisis, the 2001-2002 global recession that was exacerbated by the terror attacks of September 11, 2001, the soaring fuel prices registered from 2003 when the Second Iraq War erupted, and more recently, the global financial crisis that emerged in 2007 and is still unresolved. Last but not least, the sector has been also impacted by global epidemics such as the avian flu outbreak in 1997, SARS in 2003 and the 2009 swine flu pandemic among humans. The remarkable 9/11 terrorist attacks have resulted in the implementation of necessary security procedures and technologies in a global scale to prevent future terrorism menaces which in turn contributed to a significant increase in operating costs for airlines. Such security requirements and related costs contributed to substantial cutbacks in airline passenger service quality.

Nevertheless, the sector has a history of strong growth in traffic volumes. Since 1970, when the corresponding number of passengers flown was 383 million, it has grown at an annual average rate of more than 6%. Today, this sector consists of over 2000 airlines operating more than 23,000 aircraft, providing service to over 3700 airports [IATA 2005].

In 2004, the scheduled airline industry generated revenues of nearly $375 billion and an operating profit of $3.3 billion. The passenger traffic jumped 14% overall, being 16% in international service [ICAO 2005].

In the first four months of 2005, the sector already showed a passenger traffic growth of 8.7%. The aggregate operating profit was approximately $4.3 billion in 2005, up 30% over an operating profit of $3.3 billion in 2004, on a 10% rise in revenues to $413 billion [ICAO 2006].

In 2006, the world's airlines flew almost 28 million scheduled flight departures and carried over 2 billion passengers, achieving an operating profit of $13 billion, representing a 2.9%

margin on revenues estimated at $449 billion [IATA 2007]. After the UK terror scare in Heathrow airport in that year, the mishandled baggage became more visible problem due to the inability of airlines and airports to cope with the increase in the volume of checked baggage that resulted from restrictions on fluids in the cabin. The airport charges increased $2.6 billion as a consequence of more strict safety procedures.

In 2008, the global economic downturn propelled by the subprime financial disaster achieved a level never seen since at least the early 1970s followed by a significant increase in fuel prices when the barrel of crude oil reached its peak at $147.30 (United States Department of Energy, 2009) in July. Evidently, these external factors contributed to historic losses by airlines. The total passenger number reached 2.29 billion representing a 0.8% growth only [ICAO 2009]. On the other hand, a decrease of 2.1% in the aircraft movements and 3.7% in total cargo handled by airports were perceived. The 5 fastest growing passenger airports in 2008 were Abu Dhabi (UAE), Istanbul (Turkey), Sharjah (UAE), Sharm El Sheikh (Egypt) and Bahrain [ACI 2009].

The weakness in worldwide air traffic is expected to reach its peak in 2009 with a tiny growth or even a decline compared to 2008, while in 2010 tends to slightly recover if no other unpredictable external factor arises [ICAO 2009].

The future growth of civil aviation industry is uncertain and will depend on the uncertainties in the global geo-political environment and on the frequency and magnitude of those external factors aforementioned such as global epidemic outbreaks and evidences on global financial crisis.

2. Environmental and socio-economic impacts associated with airport operations

No matter which growth performance is expected by civil aviation industry, the sector has already achieved such a high level of passenger traffic and cargo volumes that has raised serious concerns of community members and local or state agencies regarding the associated environmental impacts of airlines and airport operations.

In the context of Sustainable Development, the air transport sector plays an important role and has been increasingly placed in the environmental agenda. The commercial aircraft operate at cruise altitudes of 8 to 13 km, where they release gases and particulates which alter the atmospheric composition and contribute to climate change. Technological progress has been made in reducing greenhouse gas (GHG) emissions, but this cannot compensate for the growth of world air traffic which has been around 50% higher in passengers-km in the last ten years [INNOVATION ENERGY ENVIRONMENT, 2009]. The perceived rapid growth of this sector can turn it into a significant source of greenhouse gas emissions, despite improvements in aircraft fuel efficiency. In the European Union, for example, whilst EU's total emissions controlled under the Kyoto Protocol fell by 5.5% from 1990 to 2003, in the same period greenhouse gas emissions from international aviation increased by 73%, corresponding to an annual growth of 4.3% per year. If the sector continues to grow at the current rate, by 2012 emissions will have increased by 150% since 1990. Although the aviation's share of overall greenhouse gas emissions represents only 3%, the rapid increase observed since 1990 may offset the progress made in other sectors. Particularly, in the EU these increasing emissions would offset more than a quarter of the reductions required by the Community's target under the Kyoto Protocol [COMMISSION OF THE EUROPEAN COMMUNITIES 2005].

It has been observed that the increase in the air passenger traffic has not been followed in the same proportion by investments in the aviation infrastructure, thus causing many

constraints that led to increasing congestion and flight delays, mishandled baggage, and dissatisfied customers due to perceptions of poor service in general.

One of the main suggested alternatives for airports to meet the massive increase in the air passenger traffic has been the expansion of airport operations by building new terminals and runways. However, this alternative solution may result in the increase in large scale of environmental impacts such as those presented in tab. 1.

Tab. 1 - Main environmental aspects and impacts associated with airport operations and expansion

Environmental Aspect	Environmental Impact
Water consumption	Degradation of human health, ecosystem quality and natural resources
Energy and fuel consumption	Air pollution, global warming
Emissions of CO_2	Global warming
Emissions of VOC	Photochemical smog (increase in ground level ozone)
Emissions of NO_x and SO_x	Acidification and eutrophication
Waste generation	Odour (if applicable), global warming (if biodegradable), air pollution (if incinerated), aesthetical/visual impact, degradation of human health and ecosystem (if improperly disposed off).
Waste water (nitrates, phosphates)	Acidification and eutrophication, degradation of aquatic habitat, soil and groundwater contamination
Heavy metals (Cr, Cd, Ni, Cu, Pb)	Health diseases and soil degradation
Noise generation	Degradation of human health and the biota in the surroundings
Light disturbance	Visual impact on the surrounding community and disturbance of local biota, mainly birds.

Note: CO_2 – carbon dioxide; VOC – volatile organic compound; NO_x – nitrogen oxides; (N_2O) - nitrous oxide, SO_x – sulfur oxides.

Own source

In some countries, the voices of important stakeholders have led to the delay and even cancellation of some airport expansion projects. To address these concerns, airports may be required to implement projects that would minimize the environmental impacts of their operations. An alternative to runway expansion is to cap the existing facilities and shift the short-haul traffic to alternate modes such as train or automobile.

The improvement of national high-speed networks observed in some European countries has been allowing trains to challenge airlines on shorter trips. Examples are illustrated by the Eurostar service between London and Paris, the high-speed rail link between Madrid and Barcelona, and also the high-speed railroads Paris-Lyon, Paris-Brussels and Hamburg-Berlin. Such transport links offered by railroad industry resulted in the reduction of services provided by airlines for these routes. The upcoming deregulation of European railroad industry to be enforced in December 2009 will extend the range of market share of railroad industry for short

routes, thus causing an additional deceleration in the growth scale of airport and airlines operations [CRUMLEY 2009].

On the other hand, as illustrated in tab. 2, the airport sector has some positive social and economic impacts which can be translated into job generation, business efficiency enhancement and tourism development. Thus, restricting airport capacity or pricing off air travel demand could have severe economic or social consequences. Studies suggest that failure to increase capacity to meet demand could **reduce GDP at a national or regional level by 2.5 to 3%,** taking all impacts into account, although this will be heavily dependent upon the level of restriction applied [ACI EUROPE 2004].

Tab. 2 - Key contribution of the European airport sector for the regional and national economic development

Key socio-economic contributions for the regional and national economic development
• Airports support employment directly on-site and in the surrounding area but also indirectly in the chain of suppliers providing goods and services. In addition, the incomes earned in these direct and indirect activities generate demand for goods and services in the economy, which supports further employment. • Nearly two-thirds (64%) of employment comes from airlines, handling agents and aircraft maintenance, with the remainder split between airport operators (14%), in-flight catering, restaurants and bars and retailing (12%), air traffic control and control agencies (6%), freight (1%) and other activities such as fuel companies and ground transport operators (3%). • The European airports on average support around **950 on-site jobs per million passengers (workload units)** per annum currently. • For every 1,000 on-site jobs supported by European airports there are around 2,100 indirect/induced jobs supported nationally, 1,100 indirect/induced jobs supported regionally, or 500 indirect/induced jobs supported sub-regionally. • **Given that there are 950 on-site jobs created per million passengers, it can be concluded that for every million passengers (workload units), European airports support around 2,950 jobs nationally, 2,000 jobs regionally, or 1,425 jobs sub-regionally.** • Airports can make a substantial contribution to the overall economy of the areas that they serve, when the combined effect of their direct, indirect and induced impact is taken into account. Estimates vary in the range 1.4 - 2.5% of GDP, excluding tourism impacts.

Source: ACI, 2004

Due to the significant socio-economic and environmental impacts inherent to their operations, airports worldwide are increasingly being managed within the framework of sustainable development guiding principles mainly as a response to the pressure received by their various stakeholders. The *World Commission on Environment and Development* defined sustainable development in 1987 in the Brundtland Report as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs"*. This new paradigm is reinforced by the "Triple Bottom Line" (TBL) approach, a term also known as "*people, profit, planet*" [Elkington 1994]. This concept according to Elkington means that

"for an organization to be sustainable – a long run perspective –, it must be financially secure, it must minimize (or ideally eliminate) its negative environmental impacts and, finally, it must act in conformity with societal expectations".

There is consensus nowadays that socially responsible business means going beyond compliance with relevant legislation and continuously investing into human capital, environmental protection and relations with stakeholders. However, the way organizations translate these concepts into practice vary according the location of the enterprise due to differences in the legislative framework between countries, the core competencies and resources available, the stakeholders' interests and the cultural traditions.

The measurement of sustainability performance requires the definition of goals and criteria by business managers in a communicative interaction with stakeholders in order to measure, to manage and to report on the indicators and issues which are key to stakeholders and the business success [Schaltegger and Wagner 2006].

Four European airports (Athens, Frankfurt, Munich and Amsterdam) have been making genuine progress as leaders in the sector towards environmental sustainability as it can be shown through their respective sustainability reports issued on annual basis. These reports have been elaborated based mainly on the sustainability reporting guidelines provided by US-based non-profit organization *Global Reporting Initiative* (GRI). A report based on GRI guidelines usually addresses the concerns and expectations of all stakeholders. In the airport sector, the stakeholders are: investors, employees, passengers, industry associations, airline companies, local authorities, journalists and local communities. However, a customized set of reporting indicators specifically conceived for airports is still on the way to be published in a multi-stakeholder process in cooperation with GRI.

The main purpose of these GRI indicators is to improve the effectiveness in managing, measuring and communicating on the impacts of airport operations on the natural and social environment which in turn will ensure the prosperity of the business in a long-term.

Sustainability reports based on the GRI reporting guidelines enable users to compare company performance, and have been used in other sectors as more than a communications platform but also a management tool for the integration of sustainability strategies into overall business processes. The airport industry becomes the latest segment of the global transportation infrastructure to take up the sustainability challenge behind others such as logistics and automotive which have already worked with GRI to create sector specific reporting guidance [GRI 2007].

3. The conventional assessment of airports in terms of passenger expectations

A London-based airline and airport passenger research firm named Skytrax has been aligned with the rapid growth of this sector and has been releasing since 1999 a world ranking of best airports based on the results gathered annually from passenger surveys conducted about more than 190 airports worldwide. The questionnaire evaluates traveller experiences across 39 different airport service and product factors - from check-in, arrivals, and transfer through to departure at the gate [Skytrax World Airport Awards 2009]. The evaluation methodology proposed by Skytrax has been shown very consistent based on the perspectives of the customers, i.e., the passengers. The tab.3 specifies these customer-driven indicators.

In June 2009, Skytrax released the newest ranking with the world's top 10 airports according to the aforementioned customer-driven criteria. The best airports according to the passenger perspective are listed on tab.4.

The Airports Council International (ACI) has also been measuring the levels of service delivered by airports worldwide through its benchmarking programme named Airport Service Quality (AQS). The evaluation is a result of a series of observations, precisely scheduled to ensure an accurate reflection of key issues throughout the airport during peak hours.

The survey captures the passengers' perception of the quality of more than 30 aspects of service that they have experienced at the airport. Interviewing covers every day of the week and every month of the year to ensure coverage of all seasons and all peaks and troughs.

Tab. 3 – List of customer-driven indicators adopted by Skytrax to evaluate airports worldwide

1	Getting to & from Airport / Accessibility	**21**	Language skills for Airport Staff
2	Public transportation options	**22**	Ease of Transit thru Airport (between flights)
3	Taxi availability / prices	**23**	Location of Airline Lounges
4	Availability of luggage trolleys (airside & landside)	**24**	Washroom / Shower facilities
5	Terminal comfort, ambience & general design / appearance	**25**	Cleanliness of Washroom facilities
6	Terminal cleanliness	**26**	TV / Entertainment facilities
7	Seating facilities throughout terminal(s)	**27**	Quiet areas / Day rooms / Rest areas
8	Immigration - queuing times (departure / arrivals)	**28**	Children's play area / facilities
9	Immigration - staff attitude (departure / arrivals)	**29**	Choice of Shopping
10	Waiting times - at Security	**30**	Prices charged in retail outlets
11	Courtesy & Attitude of Security staff	**31**	Choice of bars / cafes & restaurants
12	Check-In facilities	**32**	Prices charged in bars / cafes & restaurants
13	Terminal signage	**33**	Internet facilities / WiFi availability
14	Clarity of Boarding Calls / Airport PA's	**34**	Business centre
15	Flight Information Screens - clarity / information	**35**	Telephone / fax locations
16	Friendliness of Airport Staff	**36**	Bureau de change facilities
17	ATM facilities	**37**	Smoking policy / Smoking lounges
18	Standards of disabled persons access / facilities	**38**	Baggage Delivery times
19	Priority Baggage Delivery efficiency	**39**	Baggage Delivery - efficiency / lost luggage
20	Perception of airport security / safety standards		

Source: Skytrax, 2009

Tab. 4 – World's top 10 airports according to Skytrax criteria on service and product factors

Position	Airport name	Location
1	Incheon International Airport	Seoul, South Korea
2	Hong Kong International Airport	Hong Kong, China
3	Singapore Changi International Airport	Changi, Singapore
4	Zurich International Airport	Zurich, Switzerland
5	Munich International Airport	Munich, Germany
6	Kansai International Airport	Osaka, Japan
7	Kuala Lumpur International Airport	Kuala Lumpur, Malaysia
8	Amsterdam Airport Schiphol	Amsterdam, Netherlands
9	Centrair Nagoya Airport	Nagoya, Japan
10	Auckland International Airport	Auckland, New Zealand

Source: Skytrax, 2009

The performance measured by ASQ allows airport management to measure the service performance actually delivered by the airport and accurately pinpoint underperformance, bottlenecks and over-performance.

The methodology adopted by ACI is based on 16 key performance indicators (KPIs) which define the passenger experience through the airport. Some examples of KPIs are:

- Waiting time at check-in
- Waiting time at security
- Number of baggage carts available
- Waiting time at immigration

The tab. 5 shows the top 5 airports worldwide which were announced by ACI in March 2009.

Tab. 5 – World's top 5 airports according to AQS methodology

Position	Airport name	Location
1	Incheon International Airport	Seoul, South Korea
2	Singapore Changi International Airport	Changi, Singapore
3	Hong Kong International Airport	Hong Kong, China
4	Centrair Nagoya Airport	Nagoya, Japan
5	Halifax Stanfield International Airport	Halifax, Canada

Source: ACI, 2009

Interestingly, the top 3 airports of both rankings are the same, although the Singapore airport has shifted up one position on the ACI list. The Centrair Nagoya airport comes on the 4th position on the ACI list while on the Skytrax ranking it is on the 9th position. Curiously, Halifax Stanfield International airport appears on the 5th position of ACI list but is not among the top 10 list of Skytrax.

In case other important categories of stakeholders have to be considered, other types of indicators will have to be added. For example, for shareholders, indicators such as labour

productivity (in terms of passenger per employee, aircraft movement per employee or workload unit per employee), terminal productivity measures (in terms of passenger per gate or passenger per square meter terminal area), runway productivity (in terms of aircraft movement per runway) and financial results (in terms of total revenue per passenger, revenue per employee or revenue per movement) might be convenient for comparison [ATRS 2007].

Within the context of sustainability performance, the extent of indicators shall go far beyond by including other types of qualitative and quantitative measurements which are also important for the local authorities, local communities, employees, airline companies and various service providers and suppliers (bar, restaurants, fuel transport, ground transport operators, etc).

When the airport management decides to install automated systems to facilitate the passenger traffic flow, it is also doing aimed at cost reduction. In some airports such as La Guardia (New York), most of terminals are operated directly by airlines which in turn reduce the need for more number of employees. In one aspect, it can be expected that the employees of airlines will work more efficiently at the boarding time which can bring benefits for the customers and shareholders. On the other hand, there is a loss of permanent local employment might not be a good aspect for the local communities and local authorities.

4. The performance of airports within the context of sustainability

As previously mentioned, a specific set of sustainability indicators is being developed by GRI for the airport sector which is expected to be used as a sector supplement for the G3 general guidelines firstly issued in 2000.

Recently, GRI analyzed a sample of sustainability reports from 17 airports for the year 2007. Based on this observation, it was possible to capture the most common indicators used in this sector for sustainability reporting. Some of the indicators identified are covered by GRI G3 Guidelines whilst others are sector-specific themes. In that year, only few airports issued sustainability reports and a handful of them did it based on the G3 Guidelines.

The tab.6, tab.7 and tab.8 highlight these airport sector themes commonly identified by GRI and the Triple Bottom Line dimension (economic, social or environmental) to which they belong as well as the main targeted stakeholder by each of them.

Tab. 6 – Main Environmental themes covered by sustainability reports in the airport sector

Sector Theme	Examples of information	TBL dimension	Targeted stakeholder
Air Quality	Clean indoor air quality, monitoring concentrations and measures to reduce emissions of greenhouse gases, ozone-depleting substances and air pollutants.	Environmental	Society and Government
Energy	Description of the management measures taken to ensure conservation of as much energy as possible. Quantitative information on total energy consumption per traffic unit. Production and distribution of renewable energy.	Environmental	Society and Government
Solid Waste Reduction and Recycling	Amounts of non-hazardous industrial waste collected at the airport facilities and recovered. Overview on the disposal methods and major recycling initiatives, among other themes.	Environmental	Society and Government
Noise Abatement	Number of people and the area affected by noise, as well as noise decibel levels around the airports. Information on the number of noise complaints the airport has received per year.	Environmental	Society and Government
Green Initiatives, Buildings and Facilities	Actions taken with the aim of being in general, environmentally friendly (e.g., light-saving mechanisms, recycling activities within offices, "green" purchasing).	Environmental	Society and Employees
Water Conservation and Management	Estimates of volumes of water consumed per year. Description of water conservation initiatives (e.g., treatment of waste water and "storm water").	Environmental	Society and Government
Hydrocarbon spills	Detailed numerical information on hydrocarbon spills (e.g., graphs showing the causes of spills, number of spills in liters per 1,000 movements and number of spills that went into the environment).	Environmental	Society and Government
Environmental Communication	Commitment to engaging in environmental communication with various stakeholders in all applicable and relevant issues about the environment.	Environmental	All
Climate Change	Initiatives to reduce greenhouse gas emissions (estimated CO_2 emissions per passenger on annual basis).	Environmental	Society and Government
Natural Resources Management	Activities carried out to protect habitats, endangered species and the soil.	Environmental	Society and Government

Source: GRI, 2009

Tab. 7 – Main Social themes covered by sustainability reports in the airport sector

Sector Theme	Examples of information	TBL dimension	Targeted stakeholder
Health and Safety	Tightening security for passengers and employees. Quantitative measures of various types of injuries.	Social	Employees and Customers
Community Investment and Development	Continued and Increased communication and collaboration with the community. Amount of resources invested in community activities (e.g., sponsorships and donations for the local community). Provision of detail about employee volunteering programme.	Social	Society, Government and Employees
Customer Care	Quality of airport responses to enquiries from customers, provisions of customer service training	Social	Customers
Labour/Sustainable and Human Resources	Information on training and professional development of employees, breakdown of demographics (% of women, minorities, and disabled persons employed). Notes on future benefits and incomes of employees.	Social	Employees
Surface Access/Transportation	Implemented measures to make the use of public transport a more convenient choice for those travelling to and from the airport. Measurement of such initiatives (e.g., overall annual public transport mode share and transport mode used by passengers and staff by year).	Social	Customers and Employees

Source: GRI, 2009

Tab. 8 – Main Economic themes covered by sustainability reports in the airport sector

Sector Theme	Examples of information	TBL dimension	Targeted stakeholder
Traffic/Operational Figures	Information on the number of takeoffs and landings, passenger volumes.	Economic	Investors
Income-Generation and Distribution	Information on how much income is generated and from which sources the generated income came from. Detail on the distribution and purpose for which the income was spent (e.g., community investment, renovations, airport expansion etc). Contribution in Direct Gross Domestic Product (value added) to the region in which the airport is based.	Economic	Investors and Government
Sourcing/Supply Chain	Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation. Initiatives to only purchase from "green" suppliers and to provide "sustainable" services and products to customers.	Economic	Supplier
Airport Expansion/Construction	Information on new runways being constructed and additional terminals being built.	Economic	Investors, Society and Government

Source: GRI, 2009

The sector themes identified by GRI provide a guideline for airports worldwide on which indicators shall be of importance for sustainability reporting. However, it is important to emphasize that these indicators alone do not provide the necessary data for a real evaluation of the level of sustainability of an airport. For achieving such a challenging objective, it is recommended to go beyond and evaluate if the airport in analysis has shown progress in the quantifiable indicators in the past few years. Examples of such improvements can be illustrated by:

On **environmental issues**: a measured reduction in water and energy consumption per person (including passengers and employees), in noise generation, in the emissions of air pollutants (per aircraft movement and per passenger), etc.

On **social issues**: reduction in the incidence of accidents and injuries at work per year, reduction in the number of complaints per year by customers and local citizens, increase in the share of public transport used to/from the airport by passengers and employees, increase in the number of employment and in the level of salaries per year, increase in the investment on employee training and development per year, etc.

On **economic issues**: increase on revenues per passenger and revenues per employee, increase on dividend payouts for shareholders, decrease of fines per year for incidents of non-compliance with local regulations, increase in passenger traffic and aircraft movements, etc.

Additionally, the passenger-driven indicators such as those used by Skytrax and ACI can be embedded together with these identified by GRI into one-only wide sustainability assessment framework. A recent attempt based on this idea has been made for the airlines sector in which several indicators were measured and grouped according the expectations of stakeholders such as shareholders, employees, customers, suppliers, government and the society [Costa Jordao, Ben Rhouma 2009].

This paper gives a closer view on the top 5 airports listed by Skytrax and investigate the extent to which these acclaimed “best airports” address the sustainability issues highlighted by GRI.

A preliminary analysis on the level of reporting coverage on sustainability issues gave an idea of the follow-up results. The tab.9 shows the level of Sustainability Reporting coverage in their airports taking in consideration the following report score criteria:

Level 1: No information on sustainability issues is available on reports neither on website

Level 2: There is information related to sustainability issues only on website and is not updated

Level 3: There is no updated exclusive sustainability report but these issues are included in the Annual Report

Level 4: There is an updated exclusive sustainability report available but it is not based on GRI guidelines

Level 5: There is an exclusive sustainability report available and it is based on GRI guidelines

The tab.9 shows that only four of those listed airports are issuing a separate Corporate Social Responsibility/Sustainability report. Three of those airports do not provide information on sustainability issues neither on their annual report. Finally, only one airport (Amsterdam) among those listed is currently issuing a sustainability report based on GRI G3 guidelines. That

means, a long pathway is still expected to be done in this sector when it means reporting on sustainability issues. Hopefully, after the publication of the sector supplement for the airport sector by GRI more airports will follow the Amsterdam Schiphol Airport on their sustainable attitude.

Tab. 9 – Level of sustainability reporting coverage by top 10 airports listed by Skytrax

Airport	Sustainability reporting coverage	Country	Region
Incheon International Airport	4	South Korea	Asia
Hong Kong International Airport	3	China	Asia
Singapore Changi International Airport	2	Singapore	Asia
Zurich International Airport	4	Switzerland	Europe
Munich International Airport	4	Germany	Europe
Kansai International Airport	2	Japan	Asia
Kuala Lumpur International Airport	3	Malaysia	Asia
Amsterdam Airport Schiphol	5	Netherlands	Europe
Centrair Nagoya Airport	2	Japan	Asia
Auckland International Airport	3	New Zealand	Oceania

Source: Annual Reports, Sustainability Reports and websites of analyzed airports

The tab. 10 presents the scores obtained by each of those top 5 airports in all Triple Bottom Line (TBL) themes identified by GRI. An average score is shown for each airport in each dimension (environmental, social and economic). The following criterion was adopted for the score assignment:

1 point – when no information related to that theme was reported.

2 points – when the information related to that theme was reported only on qualitative or on quantitative way.

3 points – when the information related to that theme was reported on both qualitative and quantitative ways.

It can be noted that the best airport on environmental reporting according to GRI themes is the Zurich International Airport whilst the Incheon International Airport has shown the best reporting coverage on social and economic themes. Actually, this airport has also shown a high level of equilibrium on the information among the sustainability themes. On the other hand, the Singapore Changi International Airport has demonstrated a low concern regarding the reporting on sustainability themes, mainly on the environmental and social ones. It does not mean, however, that in practice, the airport is not performing well on these issues. Instead, it may transmit a lack of transparency for the stakeholders once the information related to all these important themes is currently not publicly available.

Based on these closer observations interlinked with the level of sustainability reporting coverage shown in tab.9, it can be expected that Kansai International airport and Centrair Nagoya airport will rather follow the same trend of Singapore International Airport. It can be also foreseen that Amsterdam Airport Schiphol will rate high on all these sector themes once it is the only airport in the list that is currently issuing a sustainability report based on GRI G3 guidelines.

At present time, the following airports are currently issuing sustainability reports according to GRI G3 guidelines: Athens International airport, Schiphol airport and those managed by AENA (several airports in Spain) and *Aeroports de Paris* (airports such as Charles de Gaule and Orly).

Tab. 10 – Quality of sustainability reporting by top 5 airports listed by Skytrax

		Airport Name				
TBL Dimension	**Sector Theme**	**ICN**	**HKG**	**SIN**	**ZRH**	**MUC**
		Score	**Score**	**Score**	**Score**	**Score**
ENV	Air Quality	3	2	1	3	3
	Energy	3	3	2	3	3
	Solid Waste Reduction and Recycling	3	3	2	3	3
	Noise Abatement	3	2	1	3	3
	Green Initiatives, Buildings and Facilities	3	3	2	3	3
	Water Conservation and Management	3	3	2	3	3
	Hydrocarbon spills	2	1	1	3	2
	Environmental Communication	2	2	1	3	2
	Climate Change	3	2	1	2	2
	Natural Resources Management	3	3	1	3	3
Average Environmental Reporting Score		**2.8**	**2.4**	**1.4**	**2.9**	**2.7**
SOC	Health and Safety	3	3	1	3	2
	Community Investment and Development	3	3	2	1	2
	Customer Care	3	3	1	1	1
	Labour/Sustainable and Human Resources	3	2	1	3	2
	Surface Access/Transportation	2	2	2	3	3
Average Social Reporting Score		**2.8**	**2.6**	**1.4**	**2.2**	**2.0**
ECO	Traffic/Operational Figures	3	3	3	3	3
	Income-Generation and Distribution	3	1	1	2	1
	Sourcing/Supply Chain	2	2	1	2	2
	Airport Expansion/Construction	3	3	2	3	2
Average Economic Reporting Score		**2.8**	**2.3**	**1.8**	**2.5**	**2.0**

Source: Annual Reports, Sustainability Reports and websites of analyzed airports

5. Conclusions and suggestions for future research

The present study shows that the "best airports" in the world can vary significantly according to the perspective analyzed. An airport that performs very well in relation to passenger expectations might not perform in a satisfactory way when analyzed upon other perspectives such as those of employees, suppliers, local communities and local authorities.

There is an emerging need nowadays of addressing the expectations of all stakeholders in the decision-making process of every business. The situation is the same for the airport sector. Therefore, a careful sustainability reporting based on the upcoming GRI sector-specific set of indicators is recommended to be widely adopted in the airport sector. Simultaneously, if a true

ranking of best airports upon the sustainability perspective is foreseen, proposed tools based on the GRI G3 guidelines and other stakeholder-specific indicators such as those used by Skytrax and ACI are not only welcomed but necessary.

It is expected that when a sustainability performance ranking for the airport sector will be created, more airports will join their efforts to address the sustainability themes in their reports and to improve on the correlated indicators on a yearly basis because such rankings will bring legitimacy for the airports in front of their main stakeholders. Among other positive consequences, an increase on investment capital from shareholders may accrue due to the fact that investors will know better how the airport management is using the financial resources and how is managing all risks related to their operations.

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LOWERING OF THE ENTROPY IN DECISION MAKING BY USING OF MODERN PREDICTION ALGORITHM

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Abstract: *Decision making belongs to the key roles of a manager. Decision making is based on informations. Each information contains some amount of entropy. In strategic management the entropy grows with the time horizon that the decision of the manager has to cover. In order to decrease the entropy of information, prognostic algorithms are used. They refine on the information which is used in decision making. The more exact the information is, the higher is the efficiency of the management.*

Keywords: *Confidence Interval, Decision Making, Entropy, Estimation, Prediction Algorithm.*

1. Introduction

Decision making plays a key role in managerial practice. It is one of the basic roles of a manager in every level of management. The basis for decision making are informations. On grounds of knowledge obtained from information the manager is able to make a decision. The more content abundant the information is, the more distinct and effective decision making is. The decision making of the manager is often influenced by an entropy. The report that the manager keeps at disposition, is often not very exact. The information contained in it is not sufficient for decision making. Under these circumstances the decision making could with quite low probability bring an economical benefit for the enterprise. Consequently it is in the managerial practice substantial to be concerned with the question of increasing the accuracy of the information. As for the area of qualitative and quantitative informations about the future development of any process in the enterprise, the manager can use for increasing of the accuracy of the informations the knowledges from the scientific field of forecasting. It offers nowadays powerful and well developed tools for increasing the accuracy of the informations. The increased information accuracy is necessary for long-term management. The importance of the interconnection between management and prognostics is growing. Especially in strategical decision making that covers longer time horizon, should management as the science cooperate narrowly with prognostics.

2. Entropy in Decision Making

By analyzing of the origin of the entropy in decision making it is necessary to use the knowledge of areas of probability and mathematical statistics. In the process of decision making the manager is able to estimate the development of the future process evolution. Many processes, which can be observed today, are the repetition of processes that occured in the past. On the basis of investigation of these processes the manager can bind set of probability of repeating it. From the fact that it is worked with the probability there, results for the manager in decision making process the necessity to face some uncertainty. This uncertainty is also called entropy. The more precise the manager is able to predict the future process development, the smaller measure of entropy will affect his decision. From this reason the effort of a manager, that decides at higher level of management, will concentrate on obtaining of maximally usable information, which means maximum accurate estimation of future process development. The estimation of future process development can have two forms: an estimation of future value of the process or an interval estimation. The value of the estimation gives

information about the value of the process in certain moment in the future. By the interval estimation the interval is estimated that will comprise the future value of the proces with desired probability. This interval is known in mathematical statistics as the confidence interval.

2.1 Entropy in managerial practice

Exact information is exceedingly important in the management. Entropy is definded on the basis of formulas known from the theory of information described by C. Shannon *(in Černý, 1981)* . An important issue is the amount of information I(X) that is indirectly proportional to the probability P(X), with which can the receiver of the information guess the content of the message X.

The amount of information is definded by the formula:

$$I(X) = f\,\frac{1}{P(X)} \tag{1}$$

By substitution of particular functional dependency in the formula (1) is obtained following relation:

$$I(X) = -\log_2 P(X) \tag{2}$$

The amount of information I(X) equals the measure of uncertainty H(X) that is through the message retrieved. The measure of uncertainty H(X) is called the entropy. The unit of the entropy in the theory of information is one bit.

2.2 Decreasing of entropy by suitable estimation of the confidence interval

Confidence intervals have an important position in the theory of statistical estimations. The width of the confidence interval is connected with the estimation accuracy. The shorter the interval, the more accurate the estimation is. If the event occures, the I(X) = 0. If the interval is wide enough, it will include the future value of the process. In this case the information that the future value belongs into this interval, will have the measure of the information I(X) = 0. Generally it is true: the bigger the width of the confidence interval, the smaller the entropy. The more accurate the confidence interval after the process of forecasting is, the higher is the amount of entropy that was retrieved.

The principle noted above is shown by the following example from managerial practice.

Assume a time series of 192 observed values that represent monthly amount of manipulated transportation units from January 1990 to December 2005. In this time period 2 estimations for every value are made. The first estimation is made by a higher manager that has all knowledge about the technology of manipulation with transportation units. The second estimation is made by a scientist having no knowledge about the technology of the process of manipulation of transportation units but having knowledge about forecasting using modern prediction algorithms. The real value and both forecasts are shown in the table 1. The forecast made by the manager based on his knowledge of process technology is called the empiric estimation The second value will be obtained by using a modern prediction algorithm working on the principle of backpropagation neural network.

Table 1

December 1999	December 2005
Real value: 33846	Real value: 30621
Empirical estimation: 41819	Empirical estimation: 29845
Prediction on the basis of neural network: 33499	Prediction on the basis of neural network: 30445

In both cases a 95% confidence interval is desired. Significance level α is set according the formula for the 100(1-α)% confidence interval.

The formulas for enumerating the lower and upper bounds of confidence interval for each algorithm can be taken into consideration. These formulas for older types of prediction algorithms are described in *(Gaynor, Kirkpatrick, 1994)*. The confidence intervals with newer algorithms like GMDH or Backpropagation algorithm can be computed for the short-term forecasting, assuming that the forecast errors are independent and Gaussian distributed. According to *(Da Silva,Moulin, 2000)* three techniques for the computation of confidence interval are available for the multilayered neural network trained by the backpropagation algorithm: (1) error output; (2) resampling; (3) multilinear regression adapted to neural networks.

The error output technique appears to be the most appropriate for the managerial practice taking into consideration its universality and relative simplicity. The procedure known from mathematical statistics can be used that hypothesizes about the suspected type of statistical distribution of the error output and verifies the hypothesis by the χ^2 test at predetermined significance levels $\alpha = 0.05$ and $\alpha = 0.01$.

The hypothesis H_0 presumes that the set of deviations (forecast - real value) has the Gaussian distribution. This hypothesis will be verified at the significance levels $\alpha = 0.05$ and $\alpha = 0.01$.

In order to achieve proper results, the statistical set should have at least 50 values. The values of monthly standard deviations for the years 2001 - 2005 will be examined. The mean value of this time series μ is -731.62, the standard deviation σ is 2649.43 and the range is 11642.

After having sorted the members of the statistical set into 8 classes, the test criteria T is enumerated according the formula for the χ^2 test:

$$T = \sum_{i=1}^{k} \frac{(n_i - np_i)^2}{np_i} \tag{3}$$

where k is the number of classes, n is the summary frequency, n_i class frequency, p_i is the class probability. The random value T for $n \to \infty$ has under H_0 the distribution $\chi^2(\nu)$, where ν is the number of degrees of freedom. $\nu = k - r - 1$, where r is the number of unknown parametres.

The hypothesis is rejected, when T belongs to the critical area W_α:

$$W_\alpha = \{ T: T > \chi_\alpha{}^2(\nu)\} \tag{4}$$

For the mean value μ = - 731.62 and for the standard deviation σ = 2649.43 the table 2, enumerating the test criteria T, is obtained.

Table 2

Interval				$\Phi(x_i)$	p_i	n^*p_i	T_i
lower bound	upper bound	x_i	n_i				
(-6740, -5055⟩		-5897.5	4	0.0256	0.0256	1.535971	3.952833
(-5055, -3370⟩		-4212.5	5	0.094453	0.068853	4.131209	0.182706
(-3370, -1685⟩		-2527.5	13	0.248938	0.154485	9.269072	1.501749
(-1685, 0⟩		-842.5	14	0.483308	0.234371	14.06226	0.000276
(0, 1685⟩		842.5	14	0.723789	0.24048	14.42881	0.012744
(1685, 3370⟩		2527.5	6	0.890674	0.166885	10.0131	1.608393
(3370, 5055⟩		4212.5	3	0.968987	0.078313	4.698773	0.614166
(5055, 6740)		5897.5	1	0.993827	0.02484	1.490415	0.161369
			n = 60			**T =**	**8.034237**

Number of the degrees of freedom is ν = 8 - 2 - 1 = 5.

The critical values of the $\chi^2(\nu)$ distribution are obtained according the statistical tables:

for α = 0.05 is $\chi_{0,05}{}^2(5) = 11.1$. T < $\chi_{0,05}{}^2(5)$, because 8.034 < 11.1. At the significance level 0.05 there is not possible to reject the hypothesis H_0. It appears from this that H_0 is accepted at the significance level α = 0.05.

At the significance level α = 0.01 is $\chi_{0,01}{}^2(5) = 15.1$. Test criteria does not belong to the critical area W_α, and the hypothesis H_o is also accepted at the significance level α = 0.01.

The formula for enumeration of lower bound and upper bound by the 100(1-α)% confidence interval by known parameter of standard deviation σ is following:

$$\bar{x} - k_a \frac{s}{\sqrt{n}} \le m \le \bar{x} + k_a \frac{s}{\sqrt{n}} \tag{5}$$

where k_a is the critical value used by Gaussian probability distribution.

The standard deviation s is defined by the formula

$$s = \sqrt{D(X)}\,, \tag{6}$$

where $D(X)$ is called dispersion of the random value X.

The manager continually empirically estimated the values for January 1999 to November 1999. By this empirical estimation the standard deviation s = 10989.64.

By continual estimating of the monthly values of the year 1999 made by the backpropagation prediction algorithm the standard deviation s = 3239.63.

The formula for lower and upper bounds of the confidence interval for empirical estimation is:

$$\bar{x} - k_{0.05}\frac{s}{\sqrt{n}} \le m \le \bar{x} + k_{0.05}\frac{s}{\sqrt{n}} \tag{7}$$

$$33846 - 1.96\frac{10989.64}{\sqrt{11}} \le m \le 33846 + 1.96\frac{10989.64}{\sqrt{11}}$$

$$27352.27 \le m \le 40339.73$$

For the estimation based on neural network following lower and upper bounds of the confidence interval after substitution following formulas are obtained:

$$33846 - 1.96\frac{3239.63}{\sqrt{11}} \le m \le 33846 + 1.96\frac{3239.63}{\sqrt{11}}$$

$$31931.72 \le m \le 35760.28$$

By the empirical estimation the estimated value fits with the 95% probability the interval $\langle 27352.27\,,\,40339.73\rangle$.

By the estimation made by the prediction algorithm working on the principle of neural network the estimated value fits with 95% probability the interval $\langle 31931.72\,,\,35760.28\rangle$.

Using the modern prediction algorithm the accuracy of estimation was increased in a significant way.

The question is, with what probability would the empirical estimation belong by given standard deviation s in december 1999 to the shorter interval? The shorter interval is the interval obtained by the prediction algorithm.

The mean value in the formula (5) is 33846. Lower and upper bounds of the more accurate confidence interval are: 31931.72 and 35760.28.

The formula (5) after substitution is following:

$$33846 - k_{?}\frac{10989.64}{\sqrt{11}} = 31931.72$$

$$k_{?} = 0.5777$$

The value α = 0.57 is found for the critical value k_a = 0.5777 according the table of critical values of Gaussian probability distribution.

In the case of empirical estimation the narrower interval is (1-0.57)%, that means 43% confidence interval for the mean value of the process. Using the prediction algorithm changes the probability, with which the mean value of the process fits the narrower interval, from 43% to 95%. It is 52% increase of the reliability.

In the same way the increase of the reliability for year 2005 is enumerated. The process for year 2005 was much smoother and thank this characteristic it was possible to estimate better its future development. The mean value of the process in december 2005 is 30621. For the

empirical estimation enumerated on the basis of 11 values of the year 2005 the standard deviation σ = 2408.6.

For predictions made using the prediction algorithm based on the principle of neural networks the standard deviation is s = 1688.4. The formula (5) is following:

for empirical estimation:

$$30621-1.96\frac{2408.6}{\sqrt{11}} \le m \le 30621+1.96\frac{2408.6}{\sqrt{11}}$$

$$29197.77 \le m \le 32044.23$$

For the backpropagation neural network it is obtained:

$$30621-1.96\frac{1688.4}{\sqrt{11}} \le m \le 30621+1.96\frac{1688.4}{\sqrt{11}}$$

$$29623.34 \le m \le 31618.66$$

The empirical estimation fits with a 95% probability the interval $\langle 29197.77\,,\,32044.23\rangle$, the estimation based on the prediction algorithm fits with the 95% probability the interval $\langle 29623.34\,,\,31618.66\rangle$.

By using of modern prediction algorithm it was possible to increase the accuracy of the estimation, but not so enormous, like it was in the year 1999. It is the result of much smoother process in 2005 that was easier to predict.

With what accuracy would the empirical estimation fit by given standard deviation s in december 2005 the shorter interval, which was obtained by the prediction algorithm?

$s_{\,empirical} = 2408.6$, the true value, that comes out in the formula (5) as the mean value, is 30621. Lower and upper-bound of the more exact interval are: 29623.34 a 31618.66.

By using of the formula 5 is obtained:

$$30621-k_{?}\frac{2408.6}{\sqrt{11}} = 29623.34$$

$k_{?} = 1.373$

The value α = 0.17 is found for the critical value k_a = 1.373 according the table of critical value of Gaussian probability distribution.

The narrower interval in the case of empirical estimation is the (1-0.17)% confidence interval, that means 83% confidence interval, for the mean value of the process. The probability that the mean value of the process fits the narrower interval, in the year 2005 from 83% to 95% by using of a modern prediction algorithm. It is an 12% increase of reliability.

Another question is to be answered at this moment: How does the increased reliability affect the entropy?

The basic formula (2) for the enumeration of the entropy is

$$H(X) = -\log_2 P(X)$$

The probability, that the mean value of the estimation fits the narrower 95% reliability interval, will be used in the formula (2).

In the case of empirical estimation in the year 1999 this probality reaches 43%. In the case of the prediction algorithm the probability is 95%.

$$H_{empiciral}(X) = - \log_2 0.43 = 1.2176$$

$$H_{prediction}(X) = - \log_2 0.95 = 0.074$$

By usage of the prediction algorithm the change the entropy is 1.1436 bit for year 1999.

In 2005 are the values of the entropy following:

$$H_{empirical}(X) = - \log_2 0.83 = 0.26882$$

$$H_{prediction}(X) = - \log_2 0.95 = 0.074$$

and the usage of the prediction algorithm reduced the entropy by 0.19482 bit.

In both cases the use of prediction algorithm changes positively the entropy and the manager can use more accurate information. This helps him to make a more effective decision.

2.3 Decreasing of entropy and its relation to the economic benefit

The use of prediction algorithm and from it resulting change of entropy would have no practical sense for the manager, if it didn´t bring any improvement in economic results of the enterprise. It would stay only in the position of speculations and abstact terms, words and numbers that would say very few.

One of the basic criteria in decision making is the profitability. How does the change of entropy influence the economical result of the enterprise will be shown on an example from the managerial practice. Values from this example were also used by calculations in the subhead 2.2.

The manager administrates an enterprise that offers transportation services. The costs related to one unit of the service are 30 €. There would be no extra costs, if the estimation was the same as the real value. In this case only the costs necessary for prestation of demanded amount of service would be present. By reason that the estimations have always some deviation, also other two kinds of expenses will be present.

Overestimated forecast causes too big potential ready for the prestation of the service. This potential will not be used. It can be taken as one fifth of the costs of the prestation of the service. Extra costs will be in this case enumerated according the formula (forecast - real value) * 6 €.

In the case of underestimated forecast there will not be sufficient capacity ready for the work. It may cause delays of prestation of the service and loss of the trust of customers. It will be assumed, that the extra costs caused by the underestimated forecast will be one fourth of the cost for prestation of one service unit. Extra costs will be calculated according to the formula (real value - forecast) * 7.50 €.

Table 3 shows real values, forecasts on the basis of empirical estimation and forecasts made by using of prediction algorithm. This table shows also the extra costs in Euro caused by these estimations.

Table 3

Month	Real value	Empirical estimation	Extra costs	Prediction algorithm	Extra costs
I.99	23069	36271	79212	28612	33258
II.99	24989	39732	88458	29521	27192
III.99	28995	43989	89964	29916	5526
IV.99	28215	40300	72510	31505	19740
V.99	32361	43989	69768	30601	13200
VI.99	32206	40470	49584	32497	1746
VII.99	27816	41819	84018	32040	25344
VIII.99	33438	41819	50286	30987	18382.5
IX.99	33071	40470	44394	33711	3840
X.99	38340	41819	20874	33749	34432.5
XI.99	35057	40470	32478	37055	11988
XII.99	33846	41819	47838	33499	2602.5
Total:			**729384**		**197252**
I.05	29547	29347	1500	31998	14706
II.05	28588	26764	13680	31552	17784
III.05	31593	29845	13110	32663	6420
IV.05	33729	28818	36832.5	33416	2347.5
V.05	32962	29347	27112.5	33531	3414
VI.05	30975	28818	16177.5	33925	17700
VII.05	29263	29347	504	30622	8154
VIII.05	30815	29845	7275	30785	225
IX.05	30810	28818	14940	31644	5004
X.05	31576	29347	16717.5	33494	11508
XI.05	31199	28818	17857.5	31470	1626
XII.05	30621	29845	5820	30445	1320
Total:			**171526.5**		**90208.5**

From the table 3 it is evident that the extra costs by using neural networks are high too. But if they are compared with the costs risen by the empirical estimation, the savings are evident. The decision of the manager that is made on the basis of scientifical prediction algorithm brings besides the decreasing of the entropy also a significant decreasing of the costs. The differences between both kinds of extra costs were lower in the year 2005. It was caused by other character of the process that was in the year 2005 relatively smooth and easily predictable.

3. Conclusion

Entropy as the measure of information uncertainty affects negatively the economical results of the enterprise. If there is a possibility to reduce the entropy by using some sophisticated scientific methods, it is advisable to do it. It brings positive effects in the process of managerial decision making. Management as an interdisciplinary scientific area has today a lot of possibilities to incorporate the research results and tools from other scientific areas. The fusion of management and prognostics brings in managerial practice an competitional advantage in the form of better planning and from that resulting lowering of the costs. The advanced prediction algorithms help the manager in a significant way to reduce the entropy in his decision making and to increase the effectiveness of decisions.

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ENHANCEMENT OF QUALITY OF SOCIAL SERVICES THROUGH QUALITY MANAGEMENT SYSTEM

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Abstract: *The paper focuses on the social services issues that are a part of modern social policy. Social services are considered to be one of the forms of assistance provided for people and if they are to be organised and effective, it is inevitable to develop them from the point of view of the quality management system.*

Keywords: *Social assistance, Social services, Social services providers, Social services financing, Social services clients.*

1. Introduction

Social services can be defined from various points of view. In the international literature the social services are described as services that are public, humanitarian and also those that provide advantages for people with problems. Further, they can be defined as activities carried out for the benefit of another person (not in the form of allowances and regulation). The social services definition itself, in fact, extends behind the description of the sphere of activity, which is, in the end, shown in the area of covering, coordination and management of social services. The Act No. 448/2008 Collection of Law on social services in the Slovak Republic in the amendment No. 1 presents the standards of quality of social services that are divided into categories.

2. Implementing Quality Management System in Social Services (ISO 9001:2000)

The quality management system, which focuses on defining the processes and production methods, *gives* the businessmen and their *customers a guarantee* that all *outputs related to* production of products or *services are assumed to have universal and defined quality.*

The essential *objective of the organisations,* businesses is *to enhance effectiveness, efficiency and quality.* It is important to understand that *quality management system* (the QMS) is a *necessity* nowadays. On the other hand, it is necessary to say that implementing the QMS does not mean automatic improvement of management of an organisation or a business; it is a long-term process that should lead to enhancement of satisfaction of the customers and interested parties, effectiveness, expense reduction, risk reduction, productivity enhancement, clear definition of responsibility, and, of course, enhancement of quality of the product itself.

The basic pillars of the system:

QUALITY – the basic pillar of the quality management system

We need to know what quality is, what we should see behind this concept and how to reach it if we want to work with it systematically. Quality is a dynamic system that includes products, services, and organisations. It is a benchmark of work effectiveness of the whole organisation. Quality is an objective in pursuit of excellence. Quality is also a method and a way to support active participation of the workers, based on involvement and responsibility of each individual. The current definition in accordance with ISO 9001:2000 says: Quality is a standard in which the needs and expectations of a customer are met.

Legislation for the quality management system:

It is not possible to implement the system into practice without accepting the basic STN EN ISO. The norms present a standard that must by provided by an organisation in the process of implementation. At the same time, the norm can be understood as an essential methodological tool that enables an organisation to prepare for the process of implementation and subsequent certification more precisely.

The quality management system development has become an inseparable part of management of every organisation. The objective of the ISO norm is an ability to manage an organisation as mutually interconnected and communicating processes. Implementation of the quality management system results in effective internal organisation but mainly in meeting the demands of the citizens – clients; they should get the services that suit their demands and needs.

Implementation of the quality management system strengthens the position of the social services institutes in various areas. It leads to, mainly:

- client – citizen satisfaction enhancement,
- guarantee of quality of the services provided,
- culture improvement in the organisations,
- more effective communication with the employees, clients and interest partners,
- obtaining the trust of the clients, employees and interest partners,
- more effective usage of accessible resources – materialistic, personnel or financial.

When implementing the quality management system in the social services institutions, the most important is the first step which is *a status and management system analysis* in the social services institutions – the diagnostic audit. The information on the intentions, objectives, activities, employees, existing documentation, records and infrastructure is included in the analysis. The outcome of the analysis is assessment of strong and weak points. The next step is to *create the quality team* whose members are the employees of the social services institutions, social and healthcare services section, and the personal issues section.

At the present, there are organised the consulting meetings with *the Services Quality Institute* for the elderly that *provides counselling and assistance during implementation of the ISO norm.*

The Services Quality Institution programme:

- Enhancement of quality of the existing services for the elderly
- Enhancement of quality and competence of the services management
- Counselling and assistance for quality guarantee
- Exchange of experiences among services providers
- Assistance with establishment of international partnerships
- Capacities development, exchange of know-how in care for the elderly

The outcome of the quality management system ISO 9001:2000 should be the quality policy whose effort should be meeting these intentions and objectives. The existing processes of an organisation in accordance with EN ISO 9001:2000 such as documents management, records management, internal audit, operating processes, controlling processes, organisational documents, restoration activity, prevention activity, etc. are documented continuously.

The benefits of the quality system implementation for an organisation can be evaluated in various levels.

1. In customers, recipients, users of services:

- meeting the demands,
- reliability,
- service accessibility in the right time,
- long-term maintenance of the required quality level.

2. In workers within an organisation:

- better working conditions,
- better work satisfaction,
- better safety and health protection,
- better ethic approach and morale.

3. For investors:

- increased economic return,
- better operating outcomes,
- higher market share,
- competitiveness.

4. For suppliers and partners:

- relationship stability,
- cooperation enhancement,
- good partnership.

5. For a company:

- guarantee of the sustainable company development,
- enhancement of the safety and health protection guarantees,
- reduction of adverse effects on the environment.

3. The Strategy for Implementing Quality Management System in Public Administration 2009-2012

The Slovak Office of Standards, Metrology and Testing in the Slovak Republic designed *the strategy for implementing the quality management system in public administration 2009-2012.* This strategic key document has been submitted to the Government of the Slovak Republic to be approved as a state policy of quality in the Slovak Republic.

The strategy represents a key strategic document in the area of quality divided into two parts: 1st part: State quality policy of the Slovak Republic,

2nd part: Implementation of the quality management system in public administration 2009-2012.

The 1st part: State quality policy of the Slovak Republic

The strategy for implementing quality management in public administration 2009-2012 respects the relevant conceptual materials approved by the Government of the Slovak Republic *(the National Strategic Reference Framework for the period of 2007-2013, the Community Strategic Guidelines, the Strategy for Sustainable Development in the European Union, the National Strategy of Sustainable Development in the Slovak Republic/the Action Plan for Sustainable Development of the Slovak Republic 2005 – 2010[1], the Conception of the Regional Development of the Slovak Republic 2001and the programmes of economic and social development of the self-governing regions). It also uses the information from the European Quality Charter and from the sources of the studies and analyses that were published by the European Institute of Public Administration (EIPA), and from the sources of the European Public Administration Network (EUPAN).*

The objective of the EUPAN is assistance and support for exchange of experiences, ideas and information on the practices applied in the state and public administration, and development of the common tools related to administration of the public affairs in the member states of the European Union and in the European Commission.

The designed vision and mission are common for all the strategic areas. In each of the strategic areas, there have been identified the strategic objectives common for all the ministries and other central organs of the state administration. The vision is to achieve the status in which quality becomes a permanent and natural value and a part of life of the citizens of the Slovak Republic; and to guarantee quality of life of the citizens of the Slovak Republic on the level of the average quality of life in the member states of the European Union. The mission of the programme as the strategic framework of the state quality policy *is to support the strategies for development of quality of production and services, quality of public administration and sustainable development of the entire society,* and also to motivate interested parties to meet the mission. The strategic objectives (global and long-term objectives):

Population safety in the basic quality-of-life indicators (energetic, food, hygienic, information, information technologies, traffic quality, environment quality, and public quality – of life, health, social security and personal property).

Health care – the global objective of this sphere is enhancement of the conditions affecting health status of the population in productive age and also in non-productive age through healthcare quality enhancement.

Social sphere and employment – the global objective of this sphere is enhancement of employment rate increase, unemployment rate decrease, social inclusion, human resources development promotion, enhancement of quality of services provided by non-profit organisations, obtaining, dissemination and development of information on employment, social exclusion, poverty and social services in direct connection with practical use of information, quality environmental infrastructure that is a key aspect and condition to guarantee sustainable economic and social development, and human resources development promotion and enhancement of quality of services provided by public administration organisations.

Public administration services – public administration is the activity performed by the organs of state administration, local administration and statutory undertakers when providing public tasks. The global objective of this sphere is to enhance quality of the provided services,

[1] *More information at www.normoff.gov.sk, www.enviro.gov.sk.*

to enhance effectiveness of the processes in public administration, and increase activity effectiveness of the public administration organizations through quality management implementation.

Informatisation of society

Entrepreneurship

Culture

Education, science, research and innovations – a scope of research, development and innovations plays a key role from the point of view of the structural and global convergence of the Slovak Republic. Their development significantly underlies speed and quality of the restructuralisation processes of the existing production structure and transformation to knowledge-based economy. *The sphere of science and research is closely related to the education system quality*. This *sphere is strongly connected* with the business processes and their *ability to develop and introduce new products and services* with a high added value *able to compete on the international and local markets. The global objective of this sphere* is modernisation and enhancement of the effectiveness of the system for education, science, research and development promotion, and to improve quality of higher education infrastructure so that they can contribute to economic competition enhancement, reduction of regional differences, establishment of new innovative (high-tech) small and middle-sized businesses, establishment of new workplaces, and enhancement of the educational process conditions at higher education institutions.

Recommendations for practice:

We would like to present a few strategic objectives that are necessary to achieve a global objective:

- to enhance effectiveness of school activities on all levels through quality management implementation (quality tools and models),
- to enhance quality of education as a basic condition of social integration and labour market integration (general accessibility of education for all employees),
- to apply quality management system as a basic unit for evaluation of competence to carry out research and development,
- to cooperate with entrepreneurial sector in innovations development,
- to cooperate in educational sphere with an accreditation commission of the Ministry of Education of the Slovak Republic,
- to promote application of the results of scientific-research work of SAV (Slovak Academy of Sciences), SMÚ (Slovak Institute of Metrology) and higher education institutions in practice,
- to enhance quality of education to increase environmental awareness of a society and to obtain information on technical tools of environmental management along with promotion of participation in eco-innovations,
- to implement the subjects of quality management at elementary and secondary schools to enhance quality of education on quality management systems.

4. Conclusion

Management as a form of direction is of a great importance also for social work and especially for the sphere of social services. Social work as a practical activity is carried out within a few various resorts, institutions, and organisations that may be institutions of state

administration, local administration, self-governing regions, non-profit sector, or non-governmental subjects. Each of the institutions is directed by a manager. Work performed by a manager and workers is the basis of success and quality of the services provided. Qualification competence, further education of the employees, and lifelong education and lifelong counselling conceptions have quite an important role in the process. We work with the key concepts such as business social policy versus business social work.

The main objective of *business social policy* is development and cultivation of human potential of the business employees and establishment of optimal economic and social climate in the business. Business social policy includes maintenance of working conditions, workplace culture, sanitary facilities, storage of clothes, personal belongings of the employees and their vehicles, meals for the employees, and their qualification. It can be defined as a means of collective and individual development of human resources in relation to better achievement of economic effects. Its essential idea and intention is development of human resources of a business and its good economic and social climate.

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AIR POLLUTION ASSESSMENT USING HIERARCHICAL FUZZY INFERENCE SYSTEMS

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Abstract: *The paper presents the current state of air pollution assessment. Air pollution is currently realized by air pollution indices and air stress indices. However, these approaches have some limitations which can be eliminated e.g. using systems based on fuzzy logic. Therefore, we design a hierarchical fuzzy inference system for air pollution assessment using data from Pardubice micro region.*

Keywords: *Air Pollution, Air Quality, Fuzzy Logic, Hierarchical Fuzzy Inference System.*

1. Introduction

Air stress indices and air quality indices were developed to assess the integral ambient air pollution. They are determined as (weighted) mean values of selected air pollutants. Strictly given limits are set for air pollutants. Local conditions and synergic relations between air pollutants and other meteorological factors are not taken into account. The stated limitations can be eliminated e.g. using systems based on fuzzy logic. Fuzzy sets allow expressing object attributes which can have non-numeric values as numeric. Numeric nature of values can deeply influence model design. Currently, application of fuzzy sets is moving from technical sciences to economic, environmental and social sphere [20, 21]. That allows processing semantics of natural language in these science branches. The main characteristics of natural language semantics is its uncertainty. Uncertainty in fuzzy sets theory can be quantified [11,27]. Communication in management and decision-making is often realized based on natural language that is why it is vague and uncertain. This fact leads to solving the uncertainty by transforming speech meaning, given by natural language semantics, to a set of real numbers by fuzzy sets. Simultaneously, it allows learning the computer to understand natural language.

Assessment of the i-th district $o_i^t \in O$, $O=\{ o_1^t, o_2^t, \dots, o_i^t, \dots, o_n^t \}$ in time t to the j-th class $\omega_{i,j}^t \in \Omega$, $\Omega=\{ \omega_{1,j}^t, \omega_{2,j}^t, \dots, \omega_{i,j}^t, \dots, \omega_{n,j}^t \}$ can be realized by fuzzy inference systems (FISs). Based on FIS it is possible to define hierarchical fuzzy inference systems (HFISs) as the assessment process becomes more efficient and it is better interpretable. The paper is structured as follows. First, current approaches to air quality indices are introduced. Then the parameters are designed which are consequently applied for the modelling by a HFIS. Finally the analysis of results is provided.

2. Air Pollution Assessment

Both the air stress indices (ASIs) and air quality indices (AQIs) consider relevant air pollutants (e.g. CO, NO_2, O_3, PM_{10} and SO_2) frequently monitored at long-term stations within air pollution monitoring networks. Air stress indices aggregate relative concentrations of different air pollutants, i.e. per air pollutant the ratio of ambient concentration and reference value [16]. As a result, air stress indices do not show a pronounced relation to people. In contrast, air quality indices quantify the impacts of a mixture of air pollutants, which is typical of the ambient air, on well-being and health of people in a graded way, i.e. they are impact related with respect to people. Current AQIs show some differences, which are summarised by

[25], e.g. different number of index classes or different class boundaries. A well-known index is the AQI developed by Environmental Protection Agency (EPA) [5]. It is defined with respect to the five main common pollutants, i.e. CO, NO_2, O_3, PM_{10} and SO_2. Modified versions of the AQI of EPA were developed by [17] taking into consideration the limit values ruling in Europe. An aggregate AQI based on the combined effects of five criteria pollutants (CO, SO_2, NO_2, O_3 and PM_{10}) taking into account the European standards was developed by [15]. The AQI uses both the direct numerical expression and the linguistic description. The values of air pollutants are transformed into a dimensionless number characterizing the state of air pollution. Based on the value of the AQI the state of air pollution can be classified into six classes. A sample of classes $\omega_{i,j}^{t} \in \Omega$ for the AQI of the Czech National Institute of Public Health (CNIPH) is presented in Table 1.

Table 1 AQI classes $\omega_{i,j}^{t} \in \Omega$ of the CNIPH

AQI	$\omega_{i,j}^{t}$	Class description
$\langle 0,1)$	$\omega_{i,1}^{t}$	Clean air, very healthy environment.
$\langle 1,2)$	$\omega_{i,2}^{t}$	Satisfactory air, healthy environment.
$\langle 2,3)$	$\omega_{i,3}^{t}$	Slightly polluted air, acceptable environment.
$\langle 3,4)$	$\omega_{i,4}^{t}$	Polluted air, environment dangerous for sensitive population.
$\langle 4,5)$	$\omega_{i,5}^{t}$	High polluted air, environment dangerous for the whole population.
$\langle 5,6)$	$\omega_{i,6}^{t}$	Very high polluted air, harmful environment.

Another AQI used in the Czech Republic was developed by the Czech Hydro meteorological Institute. The AQI is based on the results of weight concentrations measures of substances in the air (Table 2). The evaluation takes the possible influence of human health into account [23].

Table 2 AQI of the Czech Hydro meteorological Institute

Air quality	SO_2	NO_2	CO	O_3	PM_{10}
	1h [$\mu g.m^{-3}$]		8h [$\mu g.m^{-3}$]	1h [$\mu g.m^{-3}$]	
Very good	0-25	0-25	$0\text{-}1.10^3$	0-33	0-15
Good	25-50	25-50	$1.10^3\text{-}2.10^3$	33-65	15-30
Favourable	50-120	50-100	$2.10^3\text{-}4.10^3$	65-120	30-50
Satisfactory	120-250	100-200	$4.10^3\text{-}1.10^4$	120-180	50-70
Bad	250-500	200-400	$1.10^4\text{-}3.10^4$	180-240	70-150
Very bad	>500	>400	$>3.10^4$	>240	>150

The Pollution Standards Index (PSI) was initially established in response to a dramatic increase in the number of people suffering respiratory irritation due to the deteriorating air

quality. The PSI was revised, renamed to the AQI, and subsequently implemented in 1999 by the United States EPA. The new system includes breakpoints for ozone (O_3), a sub-index of 8-hour average O_3 concentrations, and a new sub-index for fine particulate matter ($PM_{2.5}$). However, even though AQI has completely replaced PSI in the United States, a greater part of the world still could not adopt the AQI system, mainly because the lack of $PM_{2.5}$ measurement capability. The Revised AQI (RAQI) is derived from the AQI, and is a background arithmetic mean index and a background arithmetic mean entropy index [10]. However, PM_{10} total mass measurement may be not sufficient as air quality index due to its complex composition since the metal content of PM10 is not related to its total mass, especially in sites with industrial activities [4]. A uniform indexing scale using well pre-established air quality standards and at the same time accounting for local conditions assessed via statistical analysis of data recorded at each monitoring station was proposed by [12] and implemented at the Athens metropolitan area. Air quality indices with unlike goals are also reported in the literature. A daily quality index was proposed by [1] to show exceeding limit values. The example of the development of an alternative AQI is used by [24] to illustrate issues related to quantifying the public health burden attributable to air pollution. The common air quality index (CAQI) proposed by [25] is a set of two indices: one for roadside monitoring sites and one for average city background conditions. A class of AQIs was developed by [2] which are easy to understand by citizens and policy-makers. They are constructed in order to be able to compare situations that differ in time and space. The hierarchical aggregation here proposed is based on the successive selection of order statistics, i.e. on percentiles and on maxima. A Pollution Index (PI) with the same objective has been applied assuming limit values established by EC [8]. Air pollution indexes have also been proposed for air pollution forecasts as reported by [3]. In this paper a PI has been proposed and implemented at the urban area of Naples. A modified version of the index has been developed assuming additive effects of pollutants. The procedure to evaluate the PI on the overall urban area is also reported. However, due to inconsistency and distinction of each air pollutant, there is a vagueness or fuzziness in air quality. Fuzziness makes the use of sharp boundaries in classification schemes hard to justify. A small increase/decrease in pollutant data, near its boundary value, will change its class. Moreover, different breakpoint concentration values and air quality standards are reported in the literature [6, 26]. Further, it would be significant to consider local conditions when defining breakpoint concentrations. As a matter of fact, different areas of the world are characterised by different climatic conditions influencing the effect of atmospheric pollutants on human health and also the response of population to air pollution could be different. This fuzziness led some environmental researchers to look for advanced assessment methods based on fuzzy logic [7], such as fuzzy synthetic evaluation [21]. Another issue is coupled to the fact that there are several pollutants presented simultaneously in the atmosphere. Therefore, the effects on human health due to the simultaneous presence of different pollutants in the atmosphere should be considered. Knowledge of the effects of a mixture of air pollutants on human health is at present limited. An attempt in considering this effect in the evaluation of PIs was proposed by [13] using a constant elasticity of substitution function but the absence of epidemiological data did not allow the assumption of the proper values for the parameters contained in the function.

3. Problem Formulation

Harmful substances in the air represent the parameters of air quality modelling. They are defined as the substances emitted into the external air or generated secondarily in the air which harmfully influent the environment directly, after a physical or chemical transformation or eventually in the interaction with other substances. Except the harmful substances, other

components influence the overall air pollution. For example, ozone, solar radiation, the speed or the direction of wind, air humidity and air pressure represent these components. Both the parameters concerning the harmful substances in the air and the meteorological parameters influence air quality development. The interaction of both types of parameters can cause an increase of air pollution and influence the human health this way. The design of the parameters, based on previous correlation analysis and recommendations of notable experts, can be realized as presented in Table 3.

Table 3 Parameters design for air quality modelling

Parameters	
Harmful substances	$x_1^t = SO_2$, SO_2 is sulphur dioxide.
	$x_2^t = O_3$, O_3 is ozone.
	$x_3^t = NO$, NO_2 (NO_x) are nitrogen oxides.
	$x_4^t = CO$, CO is carbon monoxide.
	$x_5^t = PM_{10}$, PM_{10} is particulate matter (dust).
Meteorological	$x_6^t = SW$, SW is the speed of wind.
	$x_7^t = DW$, DW is the direction of wind.
	$x_8^t = T_3$, T_3 is the temperature 3 meters above the Earth's surface.
	$x_9^t = RH$, RH is relative air humidity.
	$x_{10}^t = AP$, AP is air pressure.
	$x_{11}^t = SR$ is solar radiation.

Based on the presented facts, the following data matrix **P** can be designed

$$\mathbf{P}= \begin{array}{c|ccccc|c} & x_1^t & \dots & x_k^t & \dots & x_m^t & \\ o_1^t & x_{1,1}^t & \dots & x_{1,k}^t & \dots & x_{1,m}^t & \omega_{1,j}^t \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots \\ o_i^t & x_{i,1}^t & \dots & x_{i,k}^t & \dots & x_{i,m}^t & \omega_{i,j}^t \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots \\ o_n^t & x_{n,1}^t & \dots & x_{n,k}^t & \dots & x_{n,m}^t & \omega_{n,j}^t \end{array},$$

where $o_i^t \in O$, $O=\{o_1^t, o_2^t, \dots, o_i^t, \dots, o_n^t\}$ are objects (districts) in time t, x_k^t is the k-th parameter in time t, $x_{i,k}^t$ is the value of the parameter x_k^t for the i-th object $o_i^t \in O$, $\omega_{i,j}^t \in \Omega$ is the j-th class assigned to the i-th object $o_i^t \in O$, $\mathbf{p}_i^t = (x_{i,1}^t, x_{i,2}^t, \dots, x_{i,k}^t, \dots, x_{i,m}^t)$ is the i-th pattern, $\mathbf{x}^t = (x_1^t, x_2^t, \dots, x_k^t, \dots, x_m^t)$ is the parameters vector. The monthly values of parameters $\mathbf{x}^t = (x_1^t, x_2^t, \dots, x_k^t, \dots, x_m^t)$, m=11 for $o_i^t \in O$, $O=\{o_1^t, o_2^t, \dots, o_i^t, \dots, o_n^t\}$, districts in the city of Pardubice, Czech Republic, (Fig. 1) represent the data set **P**.

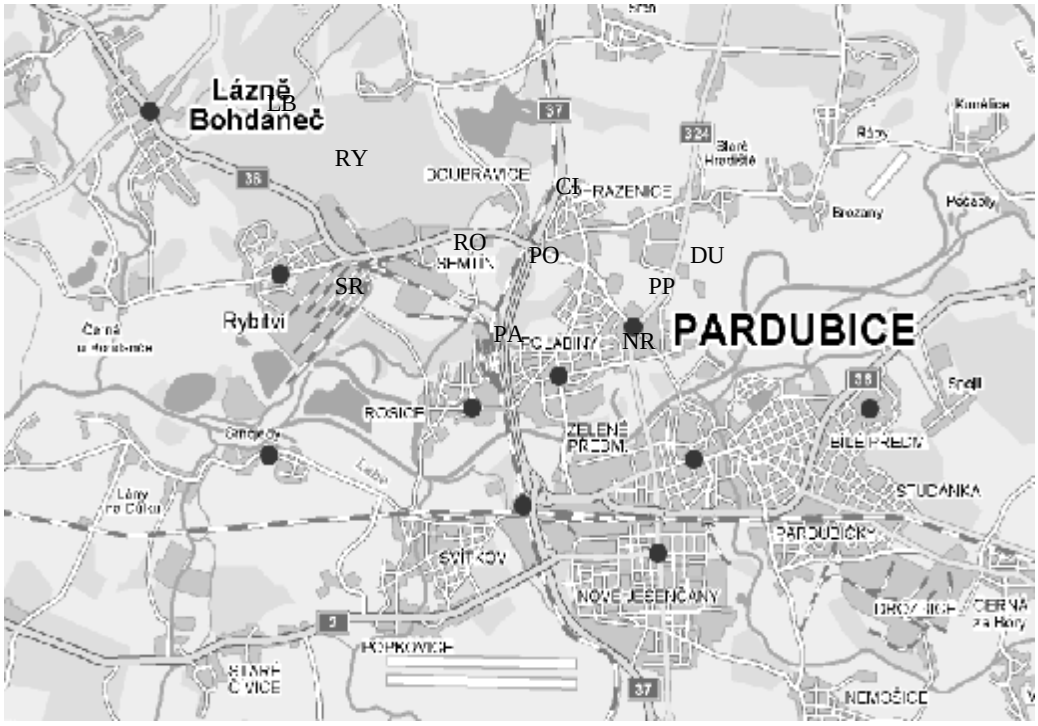

Fig. 1 The map of the districts (black points)

Legend: Bus stops: (Cihelna (CI), Dubina (DU), Polabiny (PO), Rosice (RO), Rybitví (RY), Srnojedy (SR)), crossroads: (Palacha-Pichlova (PP), Náměstí Republiky (NR)), Lázně Bohdaneč (LB), chemical factory of Paramo (PA).

4. Hierarchical Fuzzy Inference Systems Design

General structure of FIS [9,14,18,19,22] contains a fuzzification process of input variables by membership functions, design base of IF – THEN rules (BRs) or automatic IF – THEN rules extraction from input data, operators (AND, OR, NOT) application in rules, implication and aggregation within these rules and process of defuzzification of gained values to crisp values. In the process of defuzzification, standardization of inputs and their transformation to domain of values of membership function takes place. Inference mechanism in based on operations of fuzzy logic and implication within IF – THEN rules [14,19,22]. Based on aggregation process, transformation of outputs of individual IF – THEN rules to the output fuzzy set occurs. In process of defuzzification conversion of fuzzy values to expected crisp values is realized.

Let there exist the FIS of Mamdani type defined in [22]. Then the number of IF – THEN rules $p_{FIS}=k^m$, where k is the number of membership functions, m is the number of input variables. For a great number m of input variables, the FIS of Mamdani type may be inefficient due to the increase in the number p_{FIS} of IF – THEN rules. One of the ways to reduce the number p_{FIS} of IF – THEN rules is to design the FIS of Mamdani type with a hierarchical structure. The aim of HFIS design is to reach efficiency and ability to interpret (i.e. with small number p_{FIS} of IF – THEN rules with small number of variables m, and with a small number k of membership functions for each variable). Reducing the number p_{FIS} of IF – THEN rules leads to a reduction in computing demand of the system. This way, it comes to be more effective. The minimum number p_{HFIS} of IF-THEN rules is achieved if each subsystem in the HFIS has only 2 inputs (v=2). Basic types of HFISs are a tree and cascade HFIS [19,20]. Based on HFIS types mentioned, it is possible to design various different (hybrid) HFISs.

Let $x_1^t, x_2^t, \ldots, x_i^t, \ldots, x_m^t$ be input variables, and let $y_\mu^{1,1}, y_\mu^{1,2}, \ldots, y_\mu^{q,1}$ be the outputs of subsystems $FIS_\mu^{1,1}, FIS_\mu^{1,2}, \ldots, FIS_\mu^{q,1}$, where μ are membership functions. Then IF – THEN rules $R^{h_{1,1}}, R^{h_{1,2}}, \ldots, R^{h_{q,1}}$ of the tree HFIS, presented in Fig. 2, where q is the number of layers, can be defined as follows:

$$\begin{aligned}
\text{Layer 1: } & FIS_\mu^{1,1} \quad R^{h_{1,1}}: \text{IF } x_1^t \text{ is } A_1^{h_{1,1}} \text{ AND } x_2^t \text{ is } A_2^{h_{1,1}} \text{ THEN } y_\mu^{1,1} \text{ is } B^{h_{1,1}}, \\
& FIS_\mu^{1,2} \quad R^{h_{1,2}}: \text{IF } x_3^t \text{ is } A_3^{h_{1,2}} \text{ AND } x_4^t \text{ is } A_4^{h_{1,2}} \text{ THEN } y_\mu^{1,2} \text{ is } B^{h_{1,2}}, \\
& \qquad \ldots \\
\text{Layer q: } & FIS_\mu^{q,1} \quad R^{h_{q,1}}: \text{IF } y_\mu^{q-1,1} \text{ is } B^{h_{q-1,1}} \text{ AND } y_\mu^{q-1,2} \text{ is } B^{h_{q-1,2}} \text{ THEN } y_\mu^{q,1} \text{ is } B^{h_{q,1}},
\end{aligned} \tag{1}$$

where: $h_{1,1}=h_{1,2}=\ldots=h_{q,u}=\{1,2, \ldots, k^m\}$, u=1,2, $A_1^{h_{1,1}}, A_2^{h_{1,1}}, \ldots, A_n^{h_{q,1}}$ are linguistic variables corresponding to fuzzy sets represented as $\mu_1^{h_{1,1}}(x_i^t), \mu_2^{h_{1,1}}(x_i^t), \ldots, \mu_m^{h_{q,1}}(x_i^t)$, $B^{h_{1,1}}, B^{h_{1,2}}, \ldots, B^{h_{q,1}}$ are linguistic variables corresponding to fuzzy sets represented as $\mu^{h_{1,1}}(y_\eta^{1,1}), \mu^{h_{1,2}}(y_\eta^{1,2}), \ldots, \mu^{h_{q,1}}(y_\eta^{q,1})$, $\mu_{B^{h_{1,1}}}(y_j^{1,1}), \mu_{B^{h_{1,2}}}(y_j^{1,2}), \ldots, \mu_{B^{h_{q,1}}}(y_j^{q,1})$ are membership function μ values of aggregate fuzzy set for outputs $y_j^{1,1}, y_j^{1,2}, \ldots, y_j^{q,1}$.

The outputs $y_j^{1,1}, y_j^{1,2}, \ldots, y_j^{q,1}$ of particular subsystems $FIS_\mu^{1,1}, FIS_\mu^{1,2}, \ldots, FIS_\mu^{q,1}$ of the tree HFIS can be expressed by using defuzzification method Center of Gravity (COG) [19].

Input data of the tree HFIS contains parameters $\mathbf{x}^t=(x_1^t, x_2^t, \ldots, x_k^t, \ldots, x_m^t)$, m=11. The output contains classifications of objects into classes $\omega_{i,j}^t \in \Omega$. The design of this model reduces number of p_{FIS} IF – THEN rules. An important part of the model is, besides reducing number of p_{FIS} IF – THEN rules, to reproduce expert decisions in air quality modelling process, in the sense of impeaching relationships of parameters $\mathbf{x}^t=(x_1^t, x_2^t, \ldots, x_k^t, \ldots, x_m^t)$, m=11 and their mutual relations.

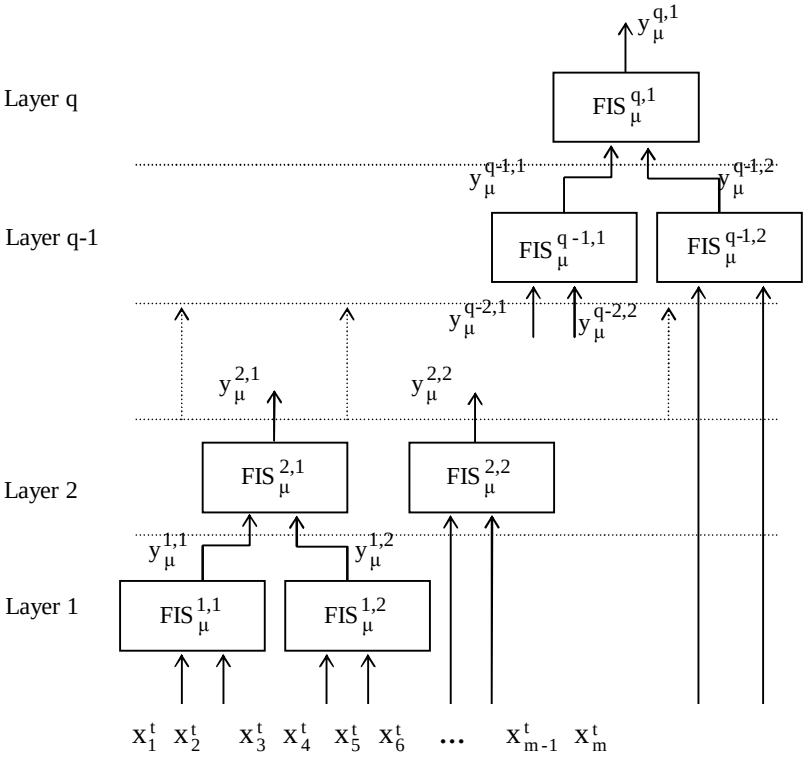

Fig. 2 A tree HFIS

5. Analysis of the Results

The design of the tree HFIS is based on the assessment of synergic relations among the harmful substances each other, and between harmful substances and meteorological factors. This is concerned with the following facts especially. When evaluating PM_{10} and SO_2 at the same time, the synergic component has to be involved. Further, the estimation of secondary oxidants in the air is determined based on the concentration of the sum of NO_x and solar radiation. The design of input and output membership functions is realized by fuzzy cluster analysis taking into account local conditions. Input parameters x_k^t are represented by three bell membership functions. Individual membership functions are described by linguistic variables values small_value_ x_k^t, medium_value_ x_k^t and great_value _ x_k^t. The base of IF – THEN rules is proposed by local experts in air quality evaluation. It has following form:

$FIS_\mu^{1,1}$ R^1: IF x_1^t is small_value_ x_1^t AND x_2^t is small_value_ x_2^t THEN $y_\mu^{1,1}$ is small_value_ $y_\mu^{1,1}$,
$FIS_\mu^{1,1}$ R^2: IF x_1^t is medium_value_ x_1^t AND x_2^t is medium_value_ x_2^t THEN $y_\mu^{1,1}$ is small_value_ $y_\mu^{1,1}$,
. . . (2)
$FIS_\mu^{1,1}$ R^9: IF x_1^t is great_value_ x_1^t AND x_2^t is great_value_ x_2^t THEN $y_\mu^{1,1}$ is great_value_ $y_\mu^{1,1}$,
. . .
$FIS_\mu^{5,1}$ R^1: IF $y_\mu^{4,1}$ is small_value_ $y_\mu^{4,1}$ AND $y_\mu^{4,2}$ is small_value_ $y_\mu^{4,2}$ THEN $y_\mu^{5,1}$ is $\omega_{i,5}^t$,
$FIS_\mu^{5,1}$ R^2: IF $y_\mu^{4,1}$ is small_value_ $y_\mu^{4,1}$ AND $y_\mu^{4,2}$ is medium_value_ $y_\mu^{4,2}$ THEN $y_\mu^{5,1}$ is $\omega_{i,5}^t$,
. . . (3)
$FIS_\mu^{5,1}$ R^9: IF $y_\mu^{4,1}$ is great_value_ $y_\mu^{4,1}$ AND $y_\mu^{4,2}$ is great_value_ $y_\mu^{4,2}$ THEN $y_\mu^{5,1}$ is $\omega_{i,1}^t$.

Classifications of the i-th district $o_i^t \in O$ in time t to the j-th class $\omega_{i,j}^t \in \Omega$ are displayed in Table 4. The results show that the classes $\omega_{i,j}^t \in \Omega$ obtained by the HFIS make it possible to realize the uncertainty in such a way that the value of membership function $\mu(\omega_{i,j}^t)$ is known for each class $\omega_{i,j}^t \in \Omega$. Three classes $\omega_{i,2}^t, \omega_{i,3}^t$ and $\omega_{i,4}^t$ dominate in the year measurements. Polluted air ($\omega_{i,4}^t$) has been detected in the centre of the town (PP, NR) due to traffic. It is obvious that there is a slight improvement of the air quality in the monitored districts $o_i^t \in O$ during the time t = 2001, 2002, … ,2006.

Table 4 Air quality classes $\omega_{i,j}^t \in \Omega$ for districts in years 2001-2006

Classes of the AQI based on the HFIS with membership function values										
year	SR	RY	RO	PP	PO	PA	NR	LB	DU	CI
2001	$\omega_{i,3}^t$ 0.55	$\omega_{i,3}^t$ 0.90	$\omega_{i,2}^t$ 0.80	$\omega_{i,4}^t$ 0.93	$\omega_{i,3}^t$ 0.94	$\omega_{i,3}^t$ 0.91	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.76	$\omega_{i,3}^t$ 0.90	$\omega_{i,3}^t$ 0.94
2002	$\omega_{i,3}^t$ 0.90	$\omega_{i,3}^t$ 0.90	$\omega_{i,2}^t$ 0.70	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.95	$\omega_{i,4}^t$ 0.95	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.80	$\omega_{i,3}^t$ 0.95	$\omega_{i,3}^t$ 0.90
2003	$\omega_{i,2}^t$ 0.63	$\omega_{i,3}^t$ 0.90	$\omega_{i,2}^t$ 0.95	$\omega_{i,4}^t$ 0.90	$\omega_{i,3}^t$ 0.90	$\omega_{i,3}^t$ 0.94	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.59	$\omega_{i,3}^t$ 0.90	$\omega_{i,3}^t$ 0.95
2004	$\omega_{i,2}^t$ 0.63	$\omega_{i,3}^t$ 0.93	$\omega_{i,2}^t$ 0.82	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.90	$\omega_{i,4}^t$ 0.79	$\omega_{i,4}^t$ 0.94	$\omega_{i,3}^t$ 0.84	$\omega_{i,3}^t$ 0.91	$\omega_{i,3}^t$ 0.90
2005	$\omega_{i,2}^t$ 0.90	$\omega_{i,3}^t$ 0.90	$\omega_{i,2}^t$ 0.66	$\omega_{i,4}^t$ 0.95	$\omega_{i,3}^t$ 0.94	$\omega_{i,3}^t$ 0.94	$\omega_{i,4}^t$ 0.92	$\omega_{i,3}^t$ 0.94	$\omega_{i,3}^t$ 0.90	$\omega_{i,3}^t$ 0.91
2006	$\omega_{i,2}^t$ 0.90	$\omega_{i,3}^t$ 0.95	$\omega_{i,2}^t$ 0.80	$\omega_{i,4}^t$ 0.95	$\omega_{i,2}^t$ 0.74	$\omega_{i,3}^t$ 0.57	$\omega_{i,4}^t$ 0.91	$\omega_{i,3}^t$ 0.76	$\omega_{i,3}^t$ 0.92	$\omega_{i,3}^t$ 0.93

In addition to yearly values, the monthly values of the air quality classes $\omega_{i,j}^t \in \Omega$ have been also evaluated by the HFIS. Based on the experiments with the data, five classes were observed in the data structure. The classes correspond to those presented in Table 1 with the

difference that the class $\omega_{i,6}^t$ is not used. Concerning monthly measurements, the classification of the i-th district $o_i^t \in O$ in time t (months) to the j-th class $\omega_{i,j}^t \in \Omega$ by the HFIS and their frequencies f are shown in Fig 3. The model of the HFIS classifies districts $o_i^t \in O$ so that classes $\omega_{i,2}^t, \omega_{i,3}^t, \omega_{i,4}^t$ have highest percentages. That means that areas with slightly polluted air prevail.

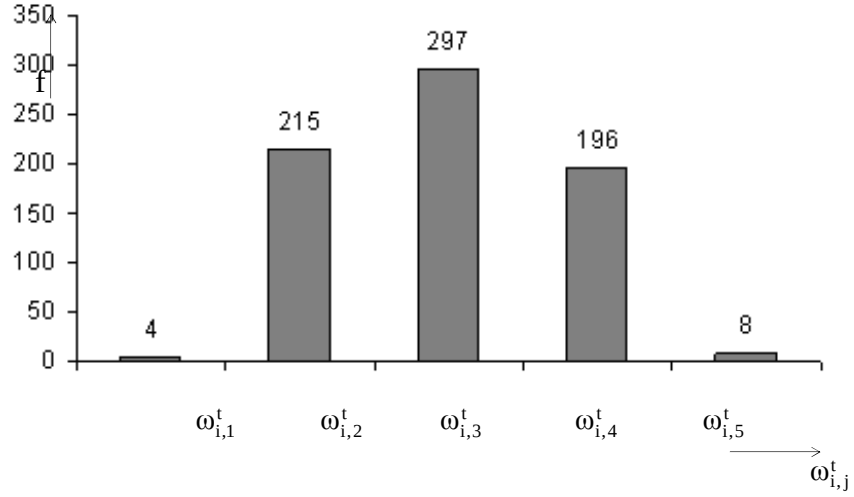

Fig. 3 Classification of the districts $o_i^t \in O$ into classes $\omega_{i,j}^t \in \Omega$, j=5 by the tree HFIS (the frequencies f of the classes)

6. Conclusion

The paper contains possibilities of HFIS design for air quality assessment. The air quality assessment task is disassembled to elementary tasks, which are trivially solvable. Trivially solvable tasks are represented by individual partial subsystems $FIS_{\mu}^{1,1}$, $FIS_{\mu}^{1,2}$, … , $FIS_{\mu}^{q,1}$, q=5 for the tree HFIS. Hierarchical fuzzy inference system designed in this manner is applied in model for air quality classification in the city of Pardubice, the Czech Republic. It is classification of the i-th district $o_i^t \in O$ in time t to the j-th class $\omega_{i,j}^t \in \Omega$ in time t. Designed model with the tree HFIS is, considering its efficiency and interpretability, a suitable tool for air quality assessment. This model allows processing semantic uncertainty. It represents efficient solution based on computational intelligence methods. It takes into account expert's decision-making in air quality modelling, thus takes into account relationships among parameters $\mathbf{x}^t=(x_1^t, x_2^t, \dots, x_k^t, \dots, x_m^t)$, m=11 and their mutual relations. The results can represent recommendations to Pardubice state administration in the area of air quality progress. The model design was carried out in Matlab Simulink in the MS Windows XP operation system.

Acknowledgement

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ADMINISTRATIVE TERRITORIAL STRUCTURES IN EU COUNTRIES AND THEIR SPECIFICS

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Abstract: *The article is focused on administrative territorial structures in European Union countries and their specifics. Each state must respect its internal, territorial and other conditions and in connection to that, create its own system of organization of these relations. Attention is given to the structure of public administration in EU countries, administrative territorial division, differences and identical characteristics, local specifics and structure and differences according to NUTS regions in EU.*

Keywords: *Public Administration, EU, Administrative Territorial Structures, Local Administration, Local Government, Specifics of Organization, Territorial Units, NUTS regions.*

1. Introduction

All member countries do not have unified organization of the public administration that is coming out of historic development, cultural or social conditions. No fundamental legal document in the European Union prescribes a model of a public administration and administrative territorial division. The areas, where European Union has no right to make decisions, are fully a responsibility of member countries. Member states decide themselves about their internal organization, system of public administration, organization of their security forces, justice, health system or wages. The current EU structure is formed by 27 states characterized by certain common but also significantly different features not only in the system of public administration.

Considerable disparities can be found among individual member states concerning political-administrative relations at all administrative levels. This is manifested particularly in different structure of administrative territorial units, their quantity, size or different designations. Significant area of European administrative reforms is also the institute of state service that shows, in individual European countries, a number of differences given by historic development, traditions and political and social conditions. This belongs to the sovereignty of individual states and is not regulated by the EU legislation, i.e. acquis communautaire.

2. Local Administration in European Union

The local administration is reaction to different needs, interests and targets in individual areas and localities that can be theoretically and practically separated from needs, interests and targets of all society. But the target of the local administration is completely specific and is focused on satisfaction of needs of a group of people with a relation to a certain locality. Practically, several limiting elements of the local administration can be found here – it is restriction in a form of target, restriction given by a territory, restriction based on a will and wanting of people living in given territory, restriction in form of so-called personal element and restriction given by a legal code. [3]

2.1 Types of Local Administration in EU Countries

In practice, three fundamental forms of local administration organization can be differentiated in EU. This is the **Anglo-Saxon system**, where the local administration is understood exclusively as self-government, because the self-government and state administration is not differentiated (it is typical for UK and Ireland). **French system**, where on the local level separated bodies of self-government and state administration exist next to each other (elected communal and regional councils on one hand and prefects on the other hand). This type of organization is a typical for France. Another type is **mixed system (Central European)**, both the self-government and state administration is executed jointly at the local level, it means by the same authorities (usually we talk about separated and delegated power). This type of the local administration is e.g. in the Czech Republic, Germany, Austria. [8]

In member states of the European Union, we can differentiate 4 organizational types of the local administration can that are characteristic for states of the original fifteen EU countries.

1 Nordic European system (Sweden, Denmark and Finland) – in this system, local administrations have a large degree of independency that is also connected with income from local taxes. Nordic European system is coming out of historic traditions – rural owners of land have always played an important role in these countries.

2 British system (United Kingdom and Ireland) – fundamental administration units are rather larger in this system. However they lack independent financial base and therefore they are also more depending on the central administration. Transfer of power to the local level is smaller than in the Nordic system.

3 Central European system (Germany and Austria) – federal organization divides power into three degrees. Local administrations are rather smaller, their size and power differs from each other in individual federal states (e.g. the mayor office in Southern Germany has more power than in north federal states). Based on historic traditions, local administrations have a great independency but always in a certain exactly given scope.

4 "Napoleonic system" (France, Spain, Italy and Netherlands) – this system is characterized by a relatively great degree of control by the central state authorities. Local administrations are more or less controlled by the mayor who is appointed by central authorities. Fundamental administration units can be quite small, but on the other hand, rather large local administrations can be also found (particularly in Italy and France). There can often exist up to four administration levels, where the middle level (departments, provinces or regions) have important coordination role (France) and in some cases also constantly increasing degree of power (Spain). [4]

2.2 Forms of Self-governments and Leading Positions in Local Self-governments in Europe

Political and administrative organization of local self-governments in different countries has certain common fundamental features:

1) Communal political bodies are naturally representative it means that they were elected in democratic elections.

2) In majority of communal political bodies, there is determining political leader, who is respected independently on the fact whether the title mayor is used or not. This person can be elected directly by citizens or by members of community board or council or can be installed by

the central government. The person can also have larger or smaller political power.

3) At least one manager of the local administration is at the majority of town halls. Very generally said, the fundamental function of this position is to control, coordinate and supervise administrative organizations; advice to politics and apply criteria of rationality, efficiency and legality in use of public finances. [6]

These three characteristics reflect fundamental principles regarding organization of local self-governments. The community board must be focused on governance or other part of executive power, as a political official it must take a role of political leadership promoting interests of the government and such a leader must have professional support. Except these characteristics, four "ideal models" (forms) of local self-government organizations can be made: model of dominant mayor, model of collective leadership, committee leadership, representative management model. [6]

Models of the local self-government organization in EU countries can be divided as follows:

- The model of dominant mayor distinctly emphasizes principles of the political leadership, personalized in a person of the mayor, above principles of the professional leadership (e.g. Spain, France, Italy, Portugal, Cyprus, Hungary).
- The model of the collective leadership, where a collective body makes decisions (e.g. executive board); here the body undertakes majority of executive powers (e.g. Belgium, Netherlands, Luxembourg, Czech Republic).
- The model of the committee leadership (e.g. Denmark, Sweden, Latvia). The common factor, in local administrations of these countries, is an occurrence of a committee executive body that executes functions of strategic management and coordination.
- Representative management model (e.g. Finland, Ireland). In the framework of this model, all executive functions are in hands of the professional manager, the local self-government manager who is appointed by the council.
- Other models (e.g. United Kingdom, Malta). [3]

3. Structure of the Public Administration in EU Countries

Administrative territorial structures in EU countries are characteristic by several levels. Since 2007 the European Union has consisted of 27 states, three of them with a federal structure (Germany, Austria and Belgium). All together the EU member states have now around 92,500 administrative units, this number changes each year in dependence on territorial reformations in individual states, central administration or federal structure. Administrative territorial division in EU countries includes one, two or three levels depending on specifics of each country. From the present twenty-seven states – 8 states have one-level structure of the territorial self-government, 12 states have two levels and 7 states have three levels of territorial self-government. The structure of EU states is documented in table 1, 2 and 3. [10]

Tab. 1: Eight Countries with One Level of Sub-national Government

Country	**Municipal level**
Bulgaria	**264** municipalities
Cyprus	**524 (378)** local governments**:** 33 (24) municipalities, 491 (354) rural communities[1]
Estonia	**227** municipalities (194) rural municipalities & 33 cities**)**
Finland	**416** municipalities
Lithuania	**60** municipalities **(**48 districts, 6 towns,6 municipalities)
Luxembourg	**116** municipalities including 12 cities
Malta	**68** local council
Slovenia	**210** municipalities including 11 urban municipalities

1. Data in parenthesis does not include the northern part of Cyprus. *Source: [10]*

12 states with two levels of the territorial self-government can be differentiated in the European Union; but they significantly differ by structure, size as well as administrative levels (Table 2).

Tab. 2: Countries with Two Levels of Sub-national Government

Country	**Municipal level**	**Second level**
Austria	**2357** municipalities (15 statutory cities, 197 towns, 755 markets &1390 villages)	9 Federated States
Czech Republic	**6249** municipalities (23 statutory cities, 496 towns & 5 733 municipalities)	14 regions
Denmark	**98** municipalities	5 regions
Greece	**1034** local governments (914 municipalities & 120 communities)	50 regions
Hungary	**3175** municipalities (23 towns with county statute, 265 towns, 2863 villages, Budapest & 23 city districts)	19 counties
Ireland	**114** local councils (29 counties, 5 cities, 75 towns & 5 boroughs)	8 regional authorities
Latvia	**527** municipalities (7 republican cities, 53 towns, 35 amalgamated municipalities & 432 rural municipalities)	26 districts
Netherlands	**443** municipalities	12 provinces
Portugal[2]	**308** municipalities	2 autonomous regions

Romania	**3173** local authorities (2854 rural municipalities, 319 urban municipalities including 211 towns & 108 municipalities)	42 counties (41 counties & Bucharest)
Slovakia	**2891** municipalities including 138 cities [3]	8 regions
Sweden	**290** municipalities	20 (18 county & 2 regions)

2. Portugal also has infra- municipal level composed of 4259 parishes. 3. Excluding districts. *Source: [10]*

7 states with three levels of the territorial self-government can be specified in the European Union; these are characterized in the table 3.

Tab.3: Countries with Three Levels of Sub-national Government

Country	**Municipal level**	**Second level**	**State or regions level**
Belgium	**589** municipalities	10 provinces	6 (3 communities and 3 regions)
France[4]	**36 683** municipalities	100 departements	26 regions
Germany	**12 312** municipalities (12196 municipalities & 116 districts- free cities)	323 rural districts	16 Federated States
Italy	**8101** municipalities	103 provinces	20 regions
Poland	**2478** municipalities (307 urban municipalities including 65 with county statute, 1587 rural municipalities & 584 mixed municipalities)	314 counties	16 regions
Spain	**8111** municipalities	50 provinces	17 autonomous communities
United Kingdom[5]	**434** local governments (127 unitary authorities, 36 metropolitan authorities 238 district councils & 33 London boroughs	34 county councils & the Greater London Authority	3 devolved nations (Scotland, Wales and Northern Ireland).

4. Including overseas departements and regions. *Source: [10]*

5. The United Kingdom also has an infra municipal level composed of more than 11,200 parishes.

Based on this, unitary states with three-level territorial administration (France, Italy, Spain, Poland, Germany, Belgium, United Kingdom), two-level territorial administration (Austria,

Ireland, Denmark, Netherlands, Greece, Portugal, Slovakia, Czech Republic, Hungary, Latvia, Sweden, Romania), but also with one-level territorial administration (Cyprus, Estonia, Finland, Lithuania, Luxembourg, Malta, Slovenia, Bulgaria) can be found.

The absence of a "regional level" in federal countries (in Austria – 9 federal states, in Belgium – 3 regions and 3 communities and in Germany 16 federal states) is substituted by the existence of federal states. These states have one-level territorial self-government under the level of federative units. Higher levels of territorial self-governments, the most often called as the "regions", exist in eight countries of the European Union. These segments represent the third level of territorial degree in Spain, France, Italy, Poland and the second level of the territorial self-government in the Czech Republic, United Kingdom and in Slovakia. [9]

A characteristic feature of the public administration in the European Union is a degree of applied centralization respectively decentralization in individual states. Although the majority of European Union states applies a middle degree of decentralization, even here some states with strong degree of decentralization can be found (Sweden, Denmark, Finland) or states, where the administration is under influence of strong centralized control (United Kingdom, Ireland), as well as so-called regionalized states (Spain, Italy), where the position of regions is so high that it is approaching the level of position of units in federal states (concurrently these states are also included in the group of unitary states). [7]

3.1 Specifics of Territorial Division in EU

The specifics, of the local organization in EU, are various territorial unit names or different number and size of these units. Structure of territorial self-government within European countries significantly differs due to their constitutional arrangement, historic development, size as well as number of inhabitants. Terms such as communities, villages, towns and municipalities can be found at the lowest level the most often; the name diversity is characteristic for the second and third level. There are e.g. districts, regions, cantons, provinces, counties etc. [7]

Other differences can be also found in financing of local administrations in individual member states of the European Union, which is not governed by unified model. Often it is explained by a different degree of local administration responsibility for personnel services in the scope of education, public health and social security.

Big unitary states such as France and Poland have self-government on the local, district and regional level. Denmark, Netherlands and Sweden have regional local level of the self-government. The United Kingdom has mixed model with two levels in some territories and one level in others (mainly but not always, the bigger cities). In the majority of countries some local uniqueness exists, when local self-governments cumulate a status of territorial self-government as well as the second level.

In France, Hungary, Poland, Czech Republic, United Kingdom and Slovakia, the capital cities (and sometimes also some other bigger cities) have a specific status that often gives them institutional organization different from the other municipalities. Similarly, in federative countries, some cities have a status of a federative state as well as a city – in Belgium (Brussels), in Austria (Vienna) and in Germany (Berlin, Bren and Hamburg). [9]

Roles of municipalities and regions are joined in big cities in Germany and Poland. For example, Vienna is the municipality and simultaneously also the state. Copenhagen and Paris are municipalities as well as regions. Big differences are in number of inhabitants and size of territory on the fundamental local level, particularly municipalities. Territorial organization in

the European Union shows a number of common features, especially generally small size of territorial self-governments at the fundamental level (municipalities) and strengthening of higher-level territorial self-government competences. [1]

Absolute autonomy for the local administration cannot be considered, because then it would represent independent nation or state. Mutual relations between local and higher levels of administrative bodies have significantly changed in recent years. The governance on the local level is a collection of formal and informal rules, structures and processes by which local participants collectively solve their problems and social needs. In all countries, functions of the local administration delegated to it, as a representative of the central administration, and functions belonging into its own autonomous competency are differentiated. [5]

3.2 Territorial Division in EU according to NUTS

Different number and size of territorial units, into which individual national economies are divided, have created a primary precondition of forming so-called statistic (artificial) regions of the European Union. The target of this system, of territorial statistical units NUTS, was to secure a comparativeness of territorial units within the whole union. The NUTS system works with five-level hierarchic classification. Except three levels of NUTS that refer to the regional level, two lower levels of territorial statistical division also exist, but those are not determining for allocation of finances from EU funds. These are so-called local administrative units (LAU). [2]

NUTS divide individual member states into regions on the level NUTS 1. Then each state divides its regions on the level NUTS 2 and these subsequently into regions on the level NUTS 3. In the majority of member states, the administrative structure is generally based on two from these three main regional levels. This existing intrastate administrative structure can be, for example on the level NUTS 1 and NUTS 3 (federal states and districts in Germany) or on the level NUTS 2 and NUTS 3 (regions and departements in France or autonomies and provinces in Spain). Depending on levels, that already exist, another level can be created on one from three levels of NUTS. With respect to that, e.g. France has functional administrative units on the level 2 and 3, another level is introduced on the level NUTS 1. This is also the case in Italy, Greece and Spain. [2]

The European Union as a confederation of 27 member states is presently divided into approximately 1,303 regions (NUTS III) that form 268 areas (NUTS II) respectively 97 territories (NUTS I). Each year there are some territorial changes. The situation in 2007 was documented by the table 4. [2]

Table 4. Overview of Levels of NUTS Regions in EU Countries

Country	**Level NUTS 1**	**Level NUTS 2**	**Level NUTS 3**
Belgium	3	11	44
Czech Republic	1	8	14
Denmark	1	1	11
Germany	16	41	429
Greece	4	13	51
Spain	7	19	59
France	9	26	100
Ireland	1	2	8
Italy	5	21	107
Estonia	1	1	5
Cyprus	1	1	1
Luxembourg	1	1	1
Lithuania	1	1	10
Latvia	1	1	6
Hungary	3	7	20
Malta	1	1	2
Netherlands	4	12	40
Austria	3	9	35
Poland	6	16	66
Portugal	3	7	30
Slovenia	1	1	12
Slovakia	1	4	8
Finland	2	5	20
Sweden	3	8	21
United Kingdom	12	37	133
Bulgaria	2	6	28
Romania	4	8	42
EU 27	**97**	**268**	**1303**

Source: [2]

4. Conclusion

The problem of the public administration and European administrative structures is not in competence of EU but individual states. Several possible views and standpoints how the European administrative structures can be characterized, systematized or differentiated exist. For example it is geographical standpoint, states can be divided according to type of state establishment, type of local organization or institute of a state service.

Duty of individual states is respecting and observing certain common administrative and legal principles, so-called four pillars of European administrative space that is particularly – a reliability and predictability, openness and transparency, responsibility, effectiveness and efficiency. [11]

The goal of the article was met, because considerable disparities exist among individual member states of EU concerning political-administrative relations at all administrative levels. Except for differences in type of state establishment and in character of territorial-administrative division of individual EU member states, differences in territorial administration, levels of territorial self-government as well as in central state administration, its structure, content or competences also exist. The common feature of the state administration in EU countries is the existence of central institution on the level of government (or its body) that covers matters of public respectively state administration. But differences occur in number and composition of ministries, in number of ministers in relation to number of ministries, in character and number of various governmental advisory bodies, in existence of other central bodies of the state administration. Similar features and specifics can be also found in the system of state service. Differences in legislation, categories of employees at all administrative levels including functional employment sectors exist among individual states.

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EXTREMISM AS ONE OF THE MAIN THREATS TO SECURITY OF THE CZECH REGIONS

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Abstract: *Area security ensuring belongs to the major activities undertaken by territorial authorities. Area security management includes legislative, administrative, economic, sociological and managerial elements, which are usually suitably mixed.*

Safety aspect within the strategic management at the level of territorial units at present - wrongly - is still quite underestimated, although it is necessary to understand that the provision of security in all circumstances must be one of the basic daily tasks for local governments.

The aim of the article is to define the focus of safety management as an important real part of strategic management and strategic planning of territorial units, to identify the most important threats to the Czech regions in the early 21st century with emphasis on extremism.

Keywords: *Area Security; Safety Management; Atrategic Management; Regions; Micro-regions; Threat; Extremism; Terrorism.*

1. Introduction

Throughout his previous existence, mankind interferes with emergencies that threaten the lives and health of people, their property or the environment. Human society is trying to prevent the occurrence of such events, or minimize their effects to acceptable levels. It builds different effective defense and protective mechanisms depending on the degree of its development.

Large-scale natural disasters, extreme environmental and industrial accidents, terrorism and extremism lead not only to an imminent threat to both people and the environment, but also may affect internal security, public order and state and local authorities operations.

The Czech Republic as a sovereign state has the duty to care for the welfare of its people. It uses all democratic tools for it. One of the most important areas is to ensure the safety and protection of the population.

2. Area security and main contemporary threats

Area security management is an important and integral part of strategic management and strategic planning of all territorial units (in particular at regional level).

Area security management can be defined as [6] a set of activities carried out especially by territorial units in order to prevent the security threats or minimize their consequences if the threat is filled.

Area security issues and different approaches to the choice of a correct conception and its solution by businesses and public administration organizations have become more numerous. However, the society has amended its longstanding traditional behavior patterns only slowly. Termination of the bipolar world has opened the door for globalization. Today's world is ever closer communication, transportation, economically and culturally linked.

2.1 What are the main contemporary threats?

If the term "threat" [2] indicates speeches, gestures, actions or actions, which express the will to cause someone smaller, larger or even irreparable damage, and any threat causes larger, or smaller concern or fear of person who is exposed to it, threats operates independently from the interests of the threatened person and therefore they are a phenomenon with an objective nature.

The threat is a social reality, whose mastery requires considerable effort and costs.

To the most important contemporary threats of the 21st century belong according to the European Security Strategy (2003) [9]:

- new forms of terrorism;
- uncontrolled proliferation of mass destruction weapons and missile technologies;
- weakening state organization and social structures in some part of the world.

3. Extremism and terrorism

Extremism and terrorism are closely related phenomena. There are number of initiatives that produce extreme action of groups and individuals. One of them is connection to the dynamics of changes in society. Rapid development and massive using of information and communications technologies reflects this dynamics. Exception to this formula are not methods of extremists who use new technologies more often then ever. Public administration should take into account extremism threats and it should be able to react.

Extremism has become security issue of today's Europe, including the Czech Republic. It can be categorized as socio-social threat. Extremist groups use terrorist methods to create atmosphere of tension, fear, or to warn of its existence. Main forms of extremism use traditional and modern activities.

Traditional activities include:

- fires;
- use of firearms and explosives;
- captured hostages.

Modern activities include:

- use of chemical and biological agens;
- use of nuclear technology;
- area of information technology.

Another traditional classification aspect of extremism is to identify the reasons (motivations), which lead to extremist activities:

Extremism motivation can be:

- economics - social;
- race;
- ethnic and nationality;
- political;
- religious;
- ecological.

State entrusted the responsibility for the fight against extremism to the specific organizations of public administration:

- Government of the Czech Republic;
- National Security Council;
- Central Crisis Force;
- Interior Ministry.

The Czech Republic may potentially be prepared for all the above referenced terrorist activities. However, the main current threats are in particular racial, ethnic and national. Extremism in the Czech Republic is mainly connected with right-wing part of skinhead movement. Reality is that extremist ideas are used in political programs by parties that are profiled as a "serious" political one and seek a legitimate position on the Czech political scene. This is extreme nationalist National Party and the Workers' Party. Increase in preference of both parties demonstrate election results. *„Overall, the Workers Party won 28 865 votes, in percentage terms 1.02%, which is almost 25 000 votes more than in previous elections. It has become the tenth most successful party to the elections.* [8] On the other side of political spectrum operate extreme left-wing parties represented by anarchist movements and Marxist-Leninist-oriented parties.

Regarding modern information technologies and extent of their use by extremists, there is no definite answer. Aspect that could help define the extent and quality of use of modern technologies by extremists is demographic structure of members and supporters of these parties, which is largely dependent on their historical development.

3.1 Development of extremism in the Czech Republic

After 1989 saw extremism rapid development in the Czech Republic. Parties and individuals draw from the attitudes and ideas of extremists from abroad, mainly from Western Europe. There has been dividing in openly racist groups and "serious" extreme right – wing parties in early nineties. Openly racist groups spread views and use violence for its purpose. "Serious" extreme right – wing parties try establish itself on official Czech political scene and address public. For these purposes it is often misused conscious simplification of complicated social problems.

Most "visible" extremist group are skinheads. Although this group is perceived by the public as homogenous group, it is not so. This is a highly differentiated society. Skinheads in its early days were non-political movement which was divided into a number of more or less politically profiled groups over time. We can identify range of groups from across the neo-Nazi skinheads and apolitical patriotic societies to left-oriented parties on the present.

Current forms of extremism in the Czech Republic structure:

Right-wing extremism is based on racism and xenophobia, it is expressed as fascism, neo – fascism, Nazism.

Left-wing extremism rejects current political system and it is often associated with anti – fascism, anarchism and communism.

Right wing extremist parties have common features:

It is **Roma issue**, unemployment and homosexuality. Roma are the least tolerated ethnicity in the Czech Republic. Surveys show that there is approximately 60% of intolerance. It can be assumed that the number is higher in reality. Level of racism against Roma is alarming and the

population with higher education is not exception. "Roma" racism can be identified across social status in whole Czech society. Increase of crime with anti-Semitic undertones has also been seen in last two years, which was not typical for the extreme right - wing. *Compared to 2007 there was registered an 50% increase of this type of crime (27 crime. acts in 2008, 18 crime acts in 2007).* [8]

Family and family values are another same issue. It is creating a climate of fear of traditional values breaking up. These parties offer to public programs with unrealistic ideas about housing policy, tax benefits for Czech families with more children and reducing bad influences, such as pornography, inappropriate television programs, or violence on television.

Education is criticized for poor technical equipment at schools, purpose - built programs and influenced teachers. The state, according to right-wing extremist parties should form elite, which will contribute to the development of the nation.

Drug issue is assessed superficially in conjunction with fast and mostly misguided solutions.

Multicultural society and the fear of opening border to the other cultures is complicated and easily exploitable issue. Foreign immigrants often become important item on the political programs of extreme right – wing parties. Simplifying the whole situation can get extremists support of specific groups of citizens and latent support for a large part of public.

Common feature of the extreme right - wing is increase in radicalization of its supporters. Competent public authorities address this phenomenon more and more attention. *In 2008 representatives of the Czech Republic participated in expert meetings, seminars and other activities focused on fight against terrorism and issue of radicalization. Findings of these workshops were shared with relevant stakeholders. The issue of radicalization is increasingly seen as crucial element of the fight against terrorism and extremism.* [8]

4. Modern communication and technology and their impact on extremism

4.1 E-government

The "e-government" term defines modern way of internal and external communication with public institutions with the help of information technology.

Main objectives are to facilitate contacts with the public authorities, to make authority work more effectively, reduce costs and improve data protection.

E-government is closely related to the concept of "e-governance", which is the use of modern technologies in management. E-governance can be applied to private and public sectors.

In public sector, it is mainly about using information and communication technologies, supporting the participation of citizens in decision - making, direct accountability of government and greater transparency and efficiency of processes.

4.2 Information technology, crime and extremism

Information technology has become a turning point in many areas. Personal computers and computer networks has created a virtual space, which is characterized as follows:

- data volume increasing;
- increasing dependence on computer systems;
- internet became a part of everyday life;

- growing demand for workers in the field of computer knowledge;
- creation of modern public administration (e-government).

Because modern information technology equipment of extreme groups increases, it is necessary that public sector respond to this phenomenon. In this context, there can be defined basic characteristics of the dangers associated with cyberspace:

- seriousness of crime is rising;
- abilities of offenders grow;
- new technologies allow easy communication and better management of offenders;
- new group of offenders operates in Cyberspace.

Virtual space is attractive for extremists, because it guarantees high level of anonymity and often low efficiency of the work of specialized teams which detect cyber crime. It is largely determined by the legislative environment. *The problem which is connected with the Internet is inability to remove web pages. Specific person was convicted for its making, but pages are not provided by the Czech providers, and are located abroad, in countries with different legal environments. It is paradoxical situation. Person is convicted of a crime for the creation of these sites but there is no tool to legally block the site, or completely delete it.* [8]

Other reasons why virtual space becomes the favourite for perpetrators of crime are:

- global availability;
- speed;
- high level of anonymity;
- difficult to detect damage;
- bad legislation.

A lot of systems are controlled by computers. Their collapse would have fatal consequences. Extremist groups are often equipped with modern technologies. If ignored easy and difficult to monitor communication and promotional activities, it is necessary to focus attention on the possibility of a general threat to the virtual space. Attack, which would be carried out by professionals could cause taking control of local or global control systems. This enables you to blackmail or causing loss of lives and property. Cyber attack could, for example to restrict the use of telephone network. National security strategy should be designed with a high level of attention to protection of cyberspace. The attack carried out by using modern technology can hit targets at various locations in the world at one time, while the costs connected with personnel and equipment are low and attack through information networks can have significant consequences. This makes this crime method attractive.

The Internet provides unique opportunities for extremist and terrorist groups and individuals, particularly for areas:

- communication;
- propaganda;
- acquisition and mobilization of new supporters;
- obtaining information.

Modern information and communication technologies allow extremists creating new organizational and communication networks. Individual extremist groups can operate autonomously with high level of interaction. Most of extremist groups provide its websites. In this way, local extremists can not only inform about their activities and promote their views,

but new trend are individual militants who use web to advice how to prepare and make terrorist acts.

In some cases, it does not have to be web pages, which are mostly attended extremist-minded people. Using e-mail can be kind of mass-distribute propaganda for people who did not request this kind of correspondent. Mailing of unsolicited email information becomes a tool for the dissemination of extremist ideas on a mass scale.

Another significant and difficult problem is modern telecommunication technology and the possibility of improper using of extremists. Examples could be mobile phones with prepaid cards. In last few years has led to pervasive. Mobile phones which use prepaid cards, guarantee anonymous and difficult to monitor communication.

5. Cooperation in ensuring area security

All subjects on the territory must today ensure the security against threats themselves or thanks to effective coordination (e.g. professional support from the external experts). Efforts to ensure the area security must respect the three basic elements:

- there is a direct causal link between the security and threats from the outsider;
- ensuring the area security is usually expensive, even though it often may not be immediately visible;
- risk resources - a dangerous entities of world chaos - are poorly visible and interventions against them are difficult.

5.1 Role of micro-region in ensuring area security

The role of the region, respectively micro-region, lies in [5] policy and executive activities of self-governing municipal bodies in the area of local development, their initiation activities in dealing with micro-issues and defining micro-programs and activities and their participation in the implementation of regional programs. Regions and micro-regions process development strategies to identify needs, determine the direction of development, development activities and strategic decision-making.

It should be noted that area security is one of the basic daily tasks of local government and it plays a vital role in strategic (micro)regional development plans. Indeed, it is one of the key areas for each territory development.

5.2 The CR Police in ensuring area security

Despite significant shortcomings, mainly resulting from lower level of used technology, the CR Police achieved some accomplishments, e. g. better search, detection and classification of extremist crimes and an increase in the intensity of interventions.

6. Ensuring area security at the level of (micro)regions and cities

Management from the perspective of state administration at the lowest level, also the village degree, is marked by the complexity of addressing the likely threats, since all the statutory laws, decrees, regulations, guidelines and instructions are mixed here.

The task of city management can be formulated in this field as follows [3]:

- to protect the lives and health of citizens and not to allow degradation of their life;
- to protect property, environmental and cultural values in the existence of an emergency;

- to participate in creating a safe space and to ensure sustainable development by eliminating the risks, effective and efficient solution of possible emergency situations.

To ensure this set of tasks, it is necessary to process, prepare and implement a series of tasks and measures, to create the rescue system and the system of crisis management authorities, to equip and train emergency foyer, to find enough financial, material and human resources to ensure the functionality of the system within the available resources. This task is indeed primarily in the responsibility of the government (government and central government), but its implementation must be clearly shared by the local government within the delegated powers.

The city play a key role in the fulfillment of the specified tasks and measures in the field of defense, security and protection, as a part of crisis management ensures their implementation and performs the tasks of state administration within the delegated powers in their locality.

For city management is crucial to ensure the cooperation:

- all components of the integrated rescue system (fire brigade, emergency medical services, the Police, ...);
- emergency services (telecommunications companies, water and sewer systems, power and gas companies, district heating companies, ...);
- selected local government bodies (school office, office work, management of road maintenance, district social security, tax office, ...);
- self-government bodies (municipal authorities);
- selected legal persons (businesses, social organizations);
- selected individuals (engineers, statics, pilots, mountaineers, speleologists, …).

In order to quality ensure the area security (municipality, micro-region, region), it is important to ensure effective cooperation between all elements involved in the exercise of services (concentration of certain services to certain places, increasing quality, good directing funds to training, etc.).

The cooperation should include:

- implementation of preventive measures and targets to eliminate and to mitigate the emergency situation;
- implementation of measures and tasks performed by the state administration and self-government bodies with other organizations in emergency situations;
- defense and civil emergency planning;
- preparation of civil sector for the implementation of economic measures within crisis conditions;
- liquidation of emergency situations consequences;
- security the functional capacity of the Integrated Rescue System;
- exchange of experiences and measures available for dealing with emergencies.

7. Conclusion

Area security management issue is still missing in the most strategic development documents.

However, experience shows that the importance of the area security management in our country and in the world is constantly growing and will continue to grow. The basis for possible implementation is the exact definition of the safety management focus, like e.g. quality management.

The main threats in the world today can be considered extremist and terrorist activities and facts related to natural phenomena (floods, torrential rain, storm, tornado). Activities of extremist guilds has recorded the increase during recent years. The characteristic features include closer global interconnections, agility and higher rate communication. These points are linked with a rapid development of modern technologies and their exploitation by extremists.

In all the examples above depends, provided an adequate legislative and financial support of course, the abilities and skills of the institutions and relevant workers of cities, (micro-)regions and countries, who by the events facing. Their readiness is an important factor that helps eliminate the incurred risks and generated damages, and also speeds up the recovery process.

The task of the area security management in this area is to be ready to deal with such events through all concerned institutions and workers as much as possible, what is closely related to the successful application of public administration modernization.

The function of public administration seems to be more difficult during the economic crisis, due to the rising of extremist behavior. Public administration must respond to these phenomena.

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ENVIRONMENT – ATTITUDE OF CITIZENS AND MUNICIPALITIES OF PARDUBICE REGION

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Abstract: *This paper deals with an attitude of citizens and municipalities of the Pardubice region to the environment. It is focused on the regional development strategy of the Czech Republic, the Pardubice region, data collection and their evaluation. Data collection was realized during autumn of the year 2008 by two questionnaires (questionnaire for citizens and questionnaire for municipalities). The goal of this paper is to describe and evaluate opinions of citizens and attitude of municipalities to this priority area of the above mentioned strategy.*

Keywords: *Environment, the Pardubice Region, Municipality, Citizen, Data Collection.*

1. Introduction

Environment is everything that creates natural conditions of existence of organisms, including human, and that is prerequisite of their further development. Its parts are generally air, water, rock, soil, organisms, ecosystems and energy [5]. Environmental protection started to be discussed issue not until 18th century. The first reference of environmental protection came with the introduction of machines into manufacture as well as replacing small manufactures with industrial complexes. Increasing demands of environment started to appear mainly with development of heavy industry [4].

Environment, nature and countryside are one of the basic priority areas of the Strategy of Regional Development of the Czech Republic (CR). Its priorities are environmental protection including nature, economical usage of material and energy resources and environmental education, training and edification.

Status of environment in the CR is improving due to reduction of production in parts of industrial branches with the highest exhalations and also due to investments to facilities for environmental protection – usage of technologies to limit emission of pollutants into the air, building of sewerage plants and such. Status of individual regions is, considering natural conditions and structure of economy, significantly varied. According to evolution of particular elements the situation in regions is flawless, but according to other indicators the region could be extremely burdened [3].

In the Pardubice region, whose main sign is variety of natural conditions, various settlement densities and industrial and agricultural production, they try to fulfill five specific goals of regional development – increasing quality of elements of environment, reducing waste production, providing ecologically harmless waste disposal and eliminating harmful substances from environment. Other goals are protection and revitalization of countryside, increasing sense of ecology and responsibility of citizens and efficient monitoring of certain elements of environment.

In issues of environment it is necessary to consider not only basic spheres of environmental protection (such as waste management, water protection), but also other factors which

influence citizens of the region. It is generally about noise from traffic, status of atmosphere, which influence worsening or improvement of situation of allergenic and acute respiratory disorders in region, industry, energetics and such.

Very important point in the area of environment is even deepening the knowledge, activities and education of environmental thinking of region citizens. That is why there are projects of environmental education, training and edification realized. Since capacities in this area in the region are insufficient and unevenly distributed, it is necessary to raise level of environmental sense of the citizens and it is also necessary to aim operations to wide scale of ages from children to seniors mainly through schools, education centers, public service and specialized eco-centers [2]. Also introduction of environmental management systems which considers environmental issues and thus limit burdening of environment from the entrepreneur sphere and other subjects belong among other activities. Knowledge of citizens, companies and institutes of environmental issues is on a very low level, therefore Pardubice region aims to the following goals [1]:

- Increasing level of sense of ecology of citizens.
- Support of eco-counseling and actions in sphere of environmental education, training and edification.
- Expansion and development of network of centers of environmental education, training and edification.
- Introduction of management systems, which considers environmental issues.
- Improving current information systems in area of environment.

Based on mentioned facts, aim of this report is to bring in and summarize attitude of citizens and municipalities of Pardubice region to environmental protection and environmental status based on data gathered by questionnaires, which took place in autumn 2008.

2. Data collection: questionnaires

Questionnaires are nowadays the most frequently used method of primary data collection. Questionnaire is used in application of individual techniques. It is efficient to create questionnaire systematically in sequent steps. Generally, it is not necessary to follow the sequence strictly. Their mutual dependency leads to the fact that decisions accepted within certain step can retroactively influence approach in other steps. Steps are, according to [8], following: determination of data to be gathered, questioning process determination, evaluation of subjects of questions., determination of questions type, formulation of questions, questionnaire structure determination, questionnaire formalization, pretest, correction, final concept. During creation of questionnaire it is vital to follow goals of the project.

Data collection of the problem was carried out by questionnaires. There were two questionnaires – for citizens (questionnaire No. 1) and for municipalities (questionnaire No. 2) of the Pardubice region.

Questionnaire for citizens of the Pardubice region: In the first part of the questionnaire there are basic questions aimed at age, gender, martial status, education and habitation. That was followed by questions about citizen knowledge about nature, landscape and environmental protection. The goal of this is to find out, whether citizens of particular region have rather positive or negative opinion on status of environment and whether citizens deem that representatives are doing their best for nature and landscape.

Further points inform about environmental situation in citizens surroundings, landscape characteristics and presence of interfering elements in surroundings according to subjective opinions of citizens. Citizens can evaluate, whether it is necessary to make some changes for example in suburbs – whether or not to add more green vegetation and such.

Final part of the questionnaire contains questions referring to usage of financial grants on problematic area of nature and landscape. Citizens can express their positive or negative opinion to situation of environment, nature and landscape. Review of surveyed questions and information for needs of further processing of obtained data is shown in Tab. 1.

Tab. 1: Questions from questionnaire oriented on citizens of the Pardubice region

Attribute	Question/attribute description	Scale	Variable type	Frequency
x_1	Region	1 - Pardubice	integer	91
		2 - Chrudim	integer	38
		3 - Ústí nad Orlicí	integer	40
		4 - Svitavy	integer	15
x_2	Age	1 – less than 20 years	integer	22
		2 - 20 - 40 years	integer	139
		3 - 40 - 60 years	integer	21
		4 – over 60 years	integer	2
x_3	Sex	1 – male	integer	90
		2 – female	integer	94
x_4	Marital status	1 – single	integer	146
		2 – married	integer	29
		3 – divorced	integer	9
		4 – widow, widower	integer	0
x_5	Education	1 – elementary	integer	2
		2 – trained	integer	19
		3 – high school (w/o graduation)	integer	7
		4 – high school (with graduation)	integer	116
		5 – AVT	integer	1
		6 - university (Bachelor)	integer	24
		7 - university (Master)	integer	15

x_6	Are you familiar with long-term priorities of your municipality development in area of environmental management and protection of nature and countryside?	1 – yes	integer	26
		2 – no	integer	91
		3 – partially	integer	67
x_7	Which of those branches should be given more attention?	1 – protection of nature and countryside	integer	83
		2 - urbanism and relation to landscape character	integer	7
		3 – waste management	integer	28
		4 – water regime in countryside	integer	20
		5 – air protection	integer	46
Attribute	**Question/attribute description**	**Scale**	**Variable type**	**Frequency**
x_8	Do you think that municipal board sufficiently informs citizens about status of nature, countryside and environment?	1 – I have sufficient amount of information about the situation	integer	27
		2 – more amount of information would be welcome	integer	110
		3 – I am not given any information	integer	47
x_9	In what way are you informed about status of environment in your surroundings?	1 – local newspapers	integer	44
		2 – special individual materials	integer	27
		3 – not informed	integer	56
		4 - other	integer	57
x_{10}	Were you ever introduced to public discussion from area of environment (for example public discussion about ground plan)?	1 – yes	integer	39
		2 – no	integer	145
x_{11}	Are you satisfied with newest changes of urban character of municipality, eventually changes of landscape character of your municipality?	1 – yes	integer	28
		2 – something is satisfactory, something is not	integer	117
		3 – no	integer	39
x_{12}	Is there any building or interference with landscape that you deem inappropriate?	1 – yes	integer	89
		2 – no	integer	95

x_{13}	Nature development should be, in your opinion, aimed mainly at:	1 – development of parks and green vegetation	integer	166
		2 – development of buildings and centers	integer	18
x_{14}	Do you deem that citizens of your municipality should be involved to decision making about development of nature and countryside in your region?	1 – yes	integer	150
		2 – no	integer	34
x_{15}	What is, in your opinion, status of nature in your neighborhood?	1 – nature is taken care of well	integer	28
		2 – nature in my neighborhood could use more attention and care	integer	132
		3 – nature and countryside are booth neglected	integer	24
x_{16}	Do you think that protection of individual elements of environment in your municipality is sufficient?	1 – definitely yes	integer	15
		2 – rather yes	integer	92
		3 - rather not	integer	58
		4 – definitely not	integer	19
Attribute	**Question/attribute description**	**Scale**	**Variable type**	**Frequency**
x_{17}	Are there enough collection spots, containers, and others for comfortable waste sorting?	1 – no	integer	121
		2 – yes	integer	63
x_{18}	Do you think that there is sufficient amount of financial resources from municipal budget for environmental protection?	1 – yes	integer	23
		2 – I have no information about that	integer	149
		3 – no	integer	12
x_{19}	Please state general problems, which you consider to be aggravating long term development plans of the municipality?	1 – material character	integer	123
		2 – non-material character	integer	61

x_{20}	Which of following should be paid more attention in your municipality?	1 – development of housing construction	integer	23
		2 – industrial zone development	integer	3
		3 – investment activities	integer	57
		4 – consideration of environmental protection needs	integer	101
x_{21}	Do you think that your municipality sufficiently uses grant resources for environmental protection?	1 – yes	integer	24
		2 - I have no information about that	integer	116
		3 – no	integer	44

Questionnaire for municipalities of the Pardubice region: This questionnaire engaged, in addition to basic municipality characteristic, following points:

- *Scope of employment of representatives in problematic area: nature, landscape and environment* (in larger cities it is presumed that worker or group of workers would be appointed to this area; smaller villages with smaller number of representatives do not have capacities to appoint worker to one area and thus the issue is handled by whole municipal council; more efficient way is to appoint one worker to the topic, however smaller villages do not have sufficient capacity);
- *Infliction of municipality in landscape* (refers to nearness of protected area, NATURA 2000 locality, memorable tree and such; There is also point about presence of protected species and also about existence of territorial system of ecological stability; municipalities, which have such location within their cadastral, usually have obligation to pay more attention to these locations and financial support);
- *status of dangerous waste collection in municipality and its frequency and also waste collection in spring and fall* (every municipality should conduct collection at least twice a year in order to prevent illegal dumps and littering of dangerous waste in public places; in larger cities there are fixed collecting locations, where people can junk dangerous waste during the year.; in this area there is one question left, namely illegal dump; statistic research implies that most of municipalities encountered illegal dump within their territory; regular waste collection and containers furnishing can rationally prevent illegal dumps);
- *air quality checking;*
- *floods* (in recent years issues of flooding are upcoming and thus research was conducted to find out whether the municipality was flooded in recent years and whether the municipality has a crisis flood plan prepared. In the Pardubice region there are critical areas nearby bigger rivers, for example the Labe, Orlice, and such; other question aims at presence of water pipes, drainage and sewerage plants).

Most municipalities expand by new housings and buildings for production and storage. That is why the questionnaire includes an important point – whether peripheral parts of municipality spreads or not. That way municipality development and also efforts of representatives to gain

new inhabitants by offering work or housing is apparent. In the last part of the questionnaire there are questions about grant drawing in environmental sphere, about existence of public notices and, above all, ways of informing citizens about measures and changes in this branch. Review of surveyed questions and information for needs of further processing of obtained data is shown in Tab. 2.

Tab. 2: Questions from questionnaire oriented on municipalities of the Pardubice region

Attribute	Question/attribute description	Scale	Variable type	Frequency
x_1	What is the number of citizens of your municipality?	1 – less than 500 citizens	integer	63
		2 – less than 1 000 citizens	integer	26
		3 – less than 5 000 citizens	integer	12
		4 – less than 10 000 citizens	integer	5
		5 – more than 10 000 citizens	integer	8
x_2	What is the average age of citizens of your municipality?	1 – less than 30 years	integer	8
		2 - less than 40 years	integer	64
		3 - less than 50 years	integer	50
x_3	Is environmental problem handled by whole municipal board or is there just one particular worker?	1 – one worker	integer	16
		2 – more workers	integer	19
		3 – whole municipal board	integer	79
x_4	Is within your cadastral unit any reserved area, locality of NATURA 2000 set, memorable tree or naturally valuable location?	1 – yes	integer	52
		2 – more than one of such places	integer	23
		3 – no, we pay the same attention to all locations	integer	39
x_5	Do you organize regular dangerous waste collection?	1 - yes, there are permanent collection places	integer	36
		2 - yes, at least twice a year	integer	63
		3 – yes, once every year	integer	12
		4 – no, citizens can deliver over the waste in larger cities	integer	3
x_6	Do you furnish containers for garden waste in spring and fall?	1 – yes	integer	41
		2 – no	integer	73

Attribute	Question/attribute description	Scale	Variable type	Frequency
x_7	Have you ever encountered an illegal dump, which you had to resolve?	1 - yes, several times	integer	72
		2 - yes, once	integer	26
		3 – no, never	integer	16
x_8	Were there any floods in past 13 years?	1 - yes, several times	integer	52
		2 - yes, once	integer	17
		3 – no, never	integer	45
x_9	Do you have municipal critical flood plan elaborated?	1 – yes	integer	76
		2 – plan is in progress	integer	2
		3 – no	integer	36
x_{10}	Does your municipality have a sewerage plant?	1 – yes	integer	42
		2 – drainage is in progress	integer	43
		3 – no	integer	29
x_{11}	Does your municipality have its own water supply?	1 – yes	integer	98
		2 – water supply is in progress	integer	1
		3 – no	integer	15
x_{12}	Is there any kind of build-up area within your municipality periphery – whether it is house-building or industrial area construction? (not considering reconstruction or modification, only projects that change urban area of the municipality)	1 – yes	integer	66
		2 – drainage is in progress	integer	26
		3 – no	integer	22
x_{13}	Do you regularly check quality of air, water, waste analyses and such?	1 – yes	integer	78
		2 – no	integer	36
x_{14}	Did your municipality obtain any grants in area of environment in last 5 years?	1 – yes	integer	63
		2 – no	integer	51
x_{15}	Is there within cadastral of your municipality any kind of protected animal or plant?	1 – yes	integer	73
		2 – no	integer	41
x_{16}	How do you inform your citizens about measures against harm to environment? – local broadcast	0 – no	integer	54
		1 – yes	integer	60

x_{17}	How do you inform your citizens about measures against damage to environment? – press	0 – no	integer	71
		1 – yes	integer	43
x_{18}	How do you inform your citizens about measures against damage to environment? – web pages	0 – no	integer	71
		1 – yes	integer	43
x_{19}	How do you inform your citizens about measures against damage to environment? – other	0 – no	integer	87
		1 – yes	integer	28
Attribute	**Question/attribute description**	**Scale**	**Variable type**	**Frequency**
x_{20}	How many regulations considering environment, nature or landscape have your municipality issued (since 2000)?	1 – less than 2	integer	82
		2 – from 2 to 5	integer	30
		3 – more than 5	integer	2
x_{21}	Do you file elements of territorial system of ecological stability in your cadastral?	1 – yes	integer	58
		2 – no	integer	56

3. Questionnaire evaluation

451 municipalities of the Pardubice region were addressed within questionnaire enquiry. Request to fill in the questionnaire was send to their e-mail boxes. Total number of 120 municipalities responded, which is approximately 27 %. 114 of them were used, which is 25 % (6 questionnaires included identification errors (wrong declaration of basic territorial unit)). Questionnaires for the citizens of the Pardubice region were filled in by 186 citizens. 184 questionnaires were used, since two of them had to be discarded, because they were filled in by citizens of different regions.

Questionnaire for the citizens of the Pardubice region: Enquired people were mainly between 20 and 40 years old. They were generally single citizens of the region (77 % enquired) with high school education with graduation – that was 61 % of enquired. Answers imply that people believe that municipality is trying to sustain good quality of environment, nature and landscape. They would, however, welcome more information about decisions in area of environment in their surroundings, but, above all, information about changes in landscape and nature characteristics (Fig. 1). Questionnaire further implies that a total of 78 % of enquired are not familiar with distribution of finance in this sphere. People would welcome more green vegetation, parks and on the other hand they would reduce construction of industrial zones, companies and such, with regard to environment, nature and landscape in their surroundings. That is the prevailing opinion. There are also those, who are fully content with current situation, obtain sufficient amount of information and are familiar with status of landscape in their surroundings. Last group consists of those inquired, who consider the situation bad. They

would welcome more care, more information, less estate building and most of all greater participation of citizens in decision-making about nature, landscape and environment in their surroundings (frequencies of answers on questions are stated in Tab. 1).

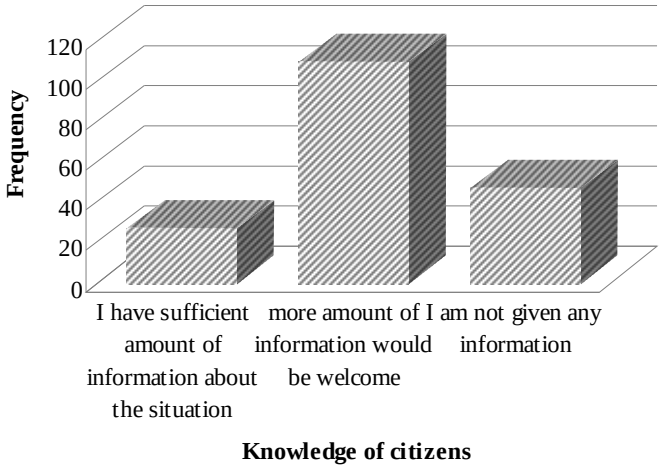

Fig. 1: Satisfaction with knowledge of citizens

It can be said that citizens of Pardubice region, which participated in questionnaires are overall rather satisfied with status of environment, landscape and nature in their surroundings.

Questionnaire for municipalities of the Pardubice region: Questionnaires were filled out by mainly smaller municipalities. From a total number of 114 of filled in questionnaires 63 were filled in by municipalities with less than 500 citizens (55 %). Situation is illustrated in Fig. 2.

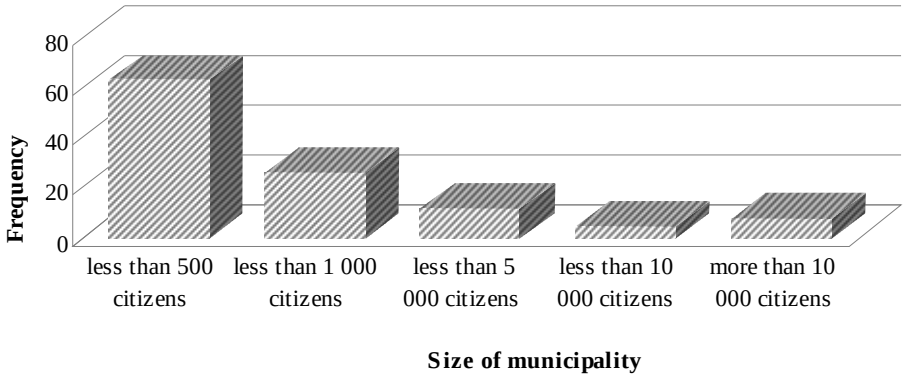

Fig. 2: Distribution of municipalities in questionnaires

In 69 % of municipalities the whole council handles environmental issues. Questionnaire was filled in mainly by municipalities which organize dangerous waste collection regularly, have or are currently building water pipes, drainage and sewerage plant, flood crisis plan, water and air analysis and file a protected species in municipality cadastral. Enquired municipalities thus largely fulfill terms of nature, landscape and environment protection. Information for citizens is generally published on municipality web pages or by local broadcast and press. A number of municipalities (58 %) are also building-up an estate.

Very good news is that only 19% of municipalities from total number of 114 do not have sewerage plant and do not even plan to build one. Graphical representation is shown in Fig. 3. These sewerage plants help the environment (waste is not returned to the nature). Great

positive for environment thereby is that most of municipalities are currently building sewerage plants (frequencies of answers within individual questions are stated in Tab. 2).

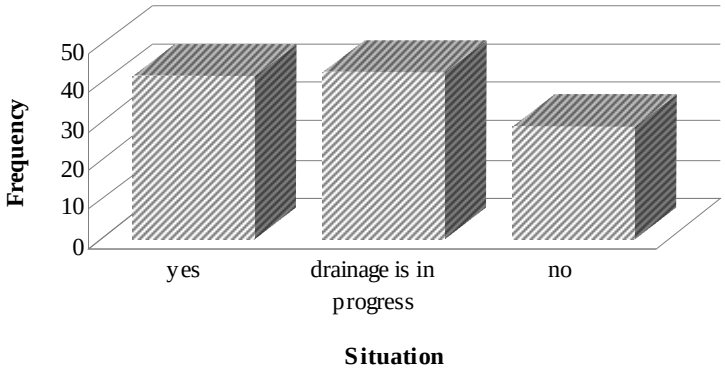

Fig. 3: Number of municipalities with sewerage plant

4. Conclusion

In 2004 the government approved two documents, which were significant for directing environmental politics in following years – State Policy of Environment until 2010 and Strategy of Sustainable Development of CR. This strategy makes an effort to limit imbalance in mutual relations among social, economical and environmental piers of society development. This policy comes also from the fact that – with our admittance to the European Union – environmental protection will need expensive investments in area of air protection, surface and underground water, waste management and such. Significant part of these investments will positively influence even regional development policy, considering employment rate and region development [3]. Sphere of "nature, landscape and environment" was defined within environmental pier of the strategy. This priority area is engaged in soil annexation and efficiency of territory estate, anti-flood measurements, amount of waste generated and its usage and environmental education and edification. Based on data collection from the end of 2008, attitude of citizens and municipalities of the Pardubice region to fulfilling goals of particular priority area it was solved in this paper.

Based on the conducted research data matrix $D_{municipality}$ (114×21) was created, which consists of 114 municipality description described by 21 characteristics (questionnaire inquiries) and data matrix $D_{citizens}$ (184×21), which contains attitudes of 184 citizens of Pardubice region. Attention was paid mainly to municipalities, since the questionnaire for citizens of the Pardubice region refers to individual subjective opinions of individual people based on their own attitude, knowledge, information and experience. Municipalities, on the other hand, should pay more attention to landscape, environment and thus respect statutory obligations about environmental protection and related regulations (for example laws [6,7]).

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PRIVATE EQUITY – FINANCING WITH ANTICRISIS ODOUR

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Abstract: *Within the context of overcoming consequences of the current financial and economic crisis has been paid attention to other form of financing than debt financing, it is (external) equity financing. The aim of this article is to point out features of so-called informal private equity financing especially, and its development in Europe; to accent some controversial aspects of this form of financing and its further possible development that has been also a subject of the explicit EU support, and that has had a connection with the Policy of the European Union towards small and medium-sized enterprises support.*

Keywords: Private Equity, Venture Capital, Business Angel Networks, Regional Policy, SMEs.

1. Introduction

Current global crisis started in the USA, which were going through the economic depression in the beginning of this century, and that's why the Federal Reserve System lowered interest rates, for recovery of economy. Money had become cheaper and interest in bank debt service increased consequently. With a certain simplification can be added: the fundamental problem in the USA became „inconspicuous“ mortages for households which haven't been paid back because of high mobility of inhabitants and which have been transferred to other actors instead. Moreover, American banks issued CDSs[1], proportion of their equity often didn't reach to demanded 8 % in agreement with Basel I or Basel II Accords issued by the Basel Committee on Banking Supervision. It cannot be discussed a propriate circumspection of American banks, vice-versa may be applied economic terminus technicus “moral hazard”on them which essence is connected with reliance on the fact that consequences of their own irresponsible acting are transferred to someone else; making use of information dominance detrimental other subject. The biggest problem of the crisis, which had a tag “financial” first, is a way and size of its pourover into the real economy.

Quickly broadening crisis symptoms all over the globalized world called up a reaction. There have been worked up some programms for reduction of crisis impacts and for assuring of development goals in the European Union, the way of disposable financial resources utilisation has been changing too, for example [16], [20].

The aim of this article is to compare informal (business angels) and formal (venture capital funds) features in context of the principle of private equity financing and to focus on possible consequences of business angels' activities across the EU above all – and in the Czech Republic concretely – in the current economic reality and with emphasis on EU institutional and financial support and focusing on relation of business angels' activities to small and medium-sized enterprises (below just „SMEs“). Interest in persisting barriers of this form of financing's

[1] CDS (credit default swap) = an option to compensate a loan, which would turn up irrevocable, in agreed proportion. A condition for utilisation is that a bank selling CDS will not get into financial insolvency. (Unfortunatelly, Lehman Brothers will not pay anything to anyone for its CDS.)

development doesn't stand aside in context of accent to development of innovations, competitiveness and employment across the European economic space.

2. Private equity financing with a view to business angels

Basically, there are two possibilities how to raise additional capital for realization of business projects – equity funding (external, connected with ownership relations, or internal which is based on reinvesting of economic results) and debt financing. Utilisation of either forms of financing is characterized by a certain persistence of its historically based tradition, the American economy differs from the European ones by its financial and capital markets' focus.

Private equity financing represents just investing of external private resources (i.e. non-public) into companies which are not listed. It includes venture capital and buy-out ivestments. Venture capital is sometimes specified as formal equity, which is realized by venture capital funds and banks. Beside them, there is so-called informal equity provided by business angels acting as individual investors or as investors associated in business angel networks. „Business angels usually provide finance in return for an equity stake in the business, but may also provide other long-term finance. This capital can complement the venture capital industry by providing smaller amounts of finance (generally under € 150 000) at an earlier stage than most venture capital firms are able to invest.“ [10]

According to both theoretical resources and current real practices, a business angel can be defined as: „an individual investor who provides with equity businesses with huge growth potential at varied stages – mostly at seed, start-up or expansive stage. In return for an investment gets business angel an equity stake in the business, mostly the minority one. The investment is supposed to appreciate during a period that is defined in advance and a form of exit happens then. Business angel provides a company with not only capital in the form of money but also with knowledge capital, it is expert knowledge, orientation in a field of his or her activity and information (contacts) about some strategic partners.“ [17]

Attention paid to private equity nowadays is understandable because – how is it mentioned in [11] – loan finance is usually a less flexible, more expensive and less secure alternative than risk capital and frequently available only under favourable economic conditions. The collateral required by banks usually poses a particular problem for SMEs and loan finance is particularly inappropriate for high-tech start-ups, where cash flow in the early stage is either negative or very limited.

Awareness of business angels' importance and their investments is also expressed by representatives of the European Business Angel Network[2] in context of necessity of innovations' support in European economies: „Great innovations are at risk. The financial and economic crisis is severely undermining the growth potential of innovative companies. Business angels and early stage investors are needed now more than ever!“ [7] There could be registered some ideas of necessity of creating some conditions for taking advantage of business angels' investments for economic development's support on the 9th annual EBAN congress held in Madrid in 2009: “It is even more important and relevant than ever before for early-stage investors across Europe as we all need to learn from each other how to adapt to both the

[2] EBAN = the European trade association for business angels and early stage investors, an independent and non-profit association representing the interests of business angel networks (BANs), early stage venture capital funds and other entities involved in bridging the equity gap in Europe. It currently federates 90 organisations in 25 countries. www.eban.org

challenges and the opportunities presented by the present exceptional economic conditions…. No one person or group has all the answers, but by sharing with each other we will all be more effective in our investing. …. It was astonishing to see how many organizations do exist and try to encourage and overcome the equity gap." [8]

2.1 The principle of private equity financing

The principle of private equity financing is investing in a business at a specific stage of development: seed-up, start-up, early stage or expansion stage. Besides buy-out investments it's a matter of venture private equity realized by either hands-on or hands-off approach. The ending of such an investment is exit realized as IPO, trade sale, refinancing, buy-back, write-off. The principle of this venture financing shows following picture 1.

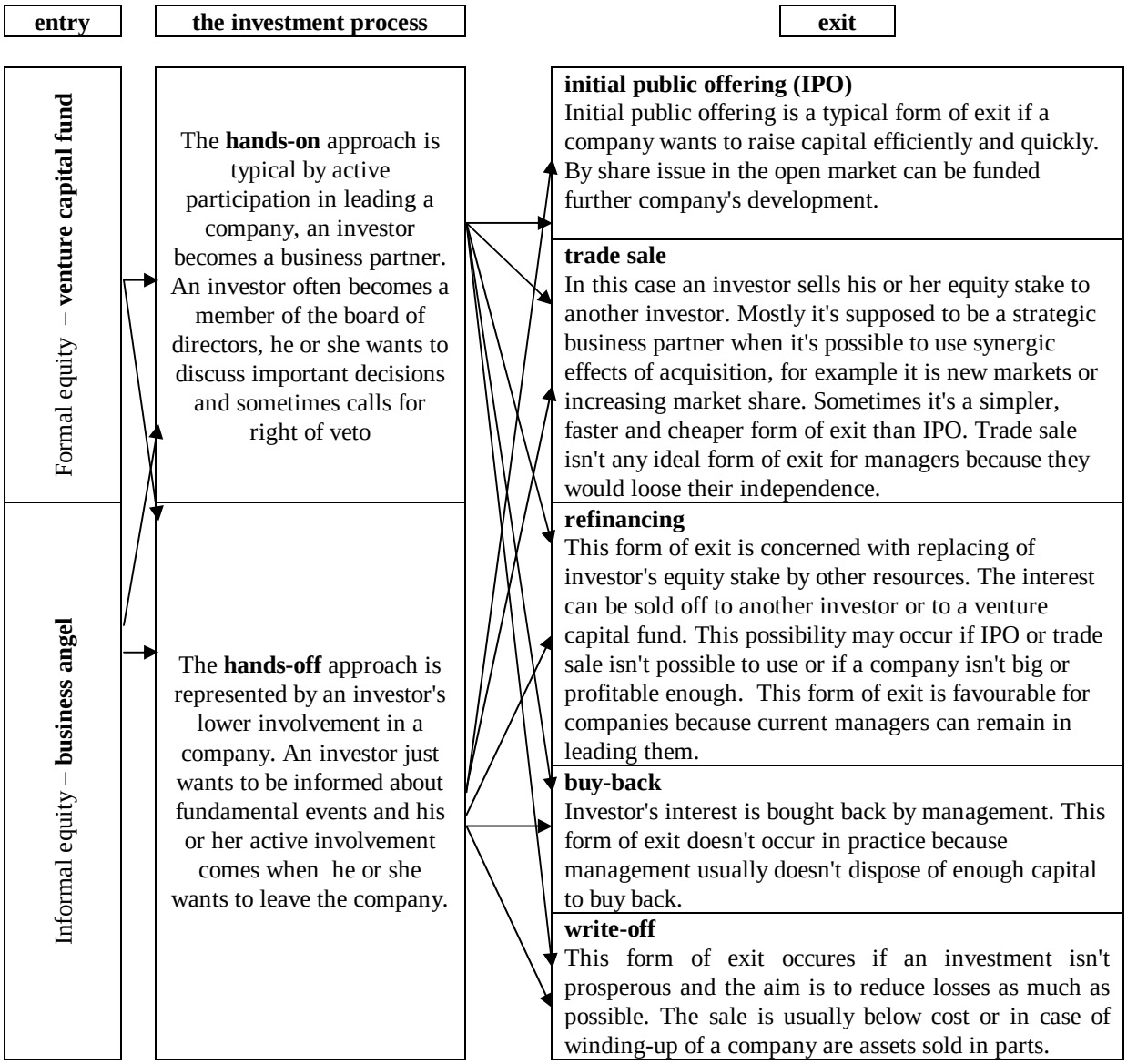


Figure 1: The principle of private equity financing (based on [17])

The purpose is to appreciate invested resources with respect for relations among three tops of the „investment triangle“: profitability, risk and liquidity [14]. The fact that it's a matter of venture investments prove data collected through a questionnaire dealing with situation of

companies, which business angel investments flew into, filled by members of EBAN: „Out of 25 networks answering the question about companies that have received financing through the network since their inception: 165 companies gone bankrupt; 88 companies have been divested as a loss; 128 companies have been divested as a profit“ [6]. On the other hand, bankrupts of business angels represent „just“ 10 % of all exits. [6]

2.2 Comparison of business angels worldwide

Business angels are associated with the USA traditionally, where venture investments began to broaden worldwide from. In recent years, there have been some leading economies in the business angel investments' market such the USA, Europe or Israel are, whereas in Africa and Latin America are business angel investments still undeveloped. But new markets have been developing very dynamically and have huge growth potential for the future. There can be expected increasing activity of business angels of the BRIC[3] countries in the future.

It is China that has been becoming very attractive country in the venture capital market, venture capital investments' volume reached $ 1.9 billion [9] in 2007. China is the most frequent receiver of venture capital after the USA. In India, there got venture capital investments' volume near to $ 1 billion and further growth is expected. The fundamental problem for business angels is lack of exits for having certainty to profit from their investments.

Business angel investments began to increase at the turn of the 20th and the 21st century. Whereas in the USA, there bursted the technology bubble which meant the end of the former successful period in 2000. Suddenly, the boom in trendy investments in internet, where most of business angels put their capital into, was over.

Globalization has been followed by increasing number of international transactions, for example there were realized 19 % [9] venture capital investments among continents in the period 2005 – 2006, it is a growth about 250 % [9] in comparison with previous five years.

The activity of business angels was increasing in 2006 and 2007, venture capital investments as a whole reached $ 35.2 billion in the USA, Europe, Israel and China in 2006 [9]. There was an increase both of numbers of deals and of volume of capital, the highest increase was reached in China that has expanded abroad.

An average payback period was prolonged to more than 6 [9] years. Moreover, companies enter global markets sooner and make business angels to invest more capital into them this way.

Global climate change, high oil prices, fears for energy sources' safety and their limited reserves are the main causes of increasing global demand for green technologies. Green technologies, biofuels and bioenergy can become the most frequented sector into which could flow foreign ivestments and within the frame of them also business angel investments. That's the reason why countries from Latin America and Asia have huge growth potential in this sector, there are grown many agricultural plants in these countries.

Another investors' favorite sector are companies concerning with IT. Business angels have been revealing African potential too. African markets aren't so integrated with international markets as for example the American ones or the European ones are, that's why African markets are more isolated from the global crisis. Moreover, for Africa is typicall huge raw

[3] Brasil, Russia, India, China

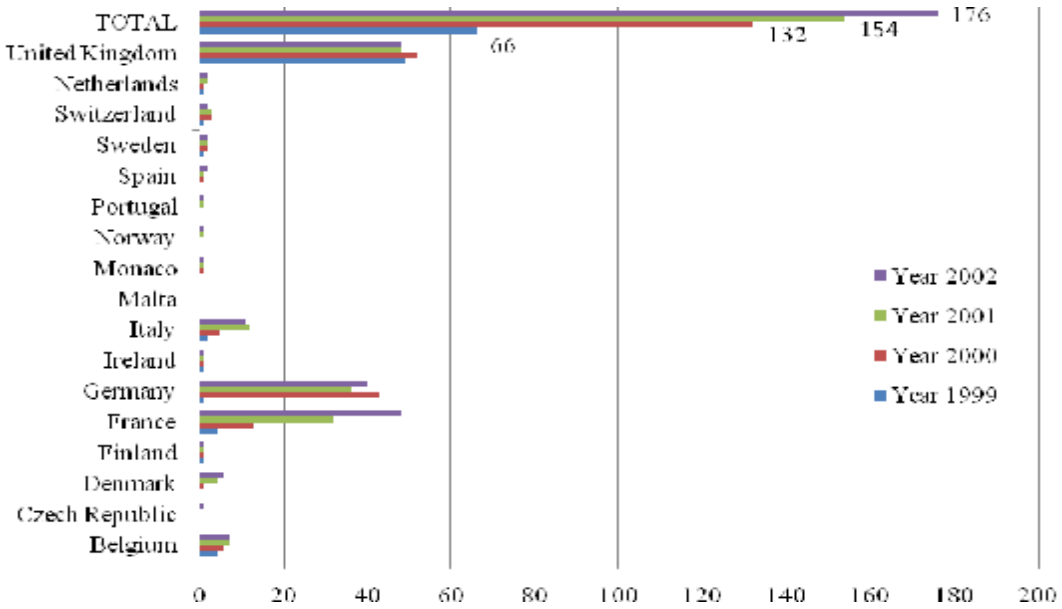
wealth that has become boom in recent years. There may be expected a big amount of business angel investments which are supposed to flow into companies concerning with extractive industry in Africa by reason of depletion of non-renewable energy sources for the future. For now, African venture capital market generally is connected with telecommunications, in this sector was Africa the second fastest growing market in 2008.

Although the whole world has been fighting lack of resources available for investments, and business angels invest less, huge volume of available capital may be found in Arabic countries. Such investors come especially from countries extracting oil as Kuwait, Katar, the United Arab Emirates or Saudi Arabia are. Arabic investors affirm there are still many opportunities to growth and success, there is just necessity of being much more creative. (fully in [17]).

2.3 Development of business angels and their networks in Europe

History of business angels in Europe was initiated in 1997 by publishing a study regarding the potential for business angel investments and networks in Europe which was connected with the Third Multiannual Programme for SMEs (1997 – 2000). This program was focused on business angel networks' support in order to increase investments of informal private investors in entrepreneurial firms among others. A result was setting up the European Business Angel Network (EBAN).

The period 1999 – 2002 was connected with very dynamic increase in the number of business angel networks in Europe, which illustrates following graph 1. There had been nearly 300% increase from 66 up to 176 and this expansion continued. Most of business angel networks operated in the United Kingdom and in Germany, the most dynamic progress was in France. In the Czech Republic, there have been operating two business angel networks, according to the latest available EBAN's compendium: the Angel Investor Association and the Hidalgo Partners [6]. According to the CzechInvest, the investment and business development agency of the Czech Republic, there have been operating four business angel networks in the Czech Republic: the Angel Investor Association, the Central Europe Angel Club, the Business Angels Czech and the Business Angels Network [2].



Graph 1: The development of business angel networks in Europe in the period 1999 – 2002 (Source: based on [4])

In comparison with venture capital funds, business angel ivestments are characterized by a higher number of contracts (it's getting close to two-thirds of total private equity financing), the amounts of investments oscillate about 50 %, nevertheless, the average amounts of investments are dramatically smaller. Concrete data from the period 2005 – 2007 shows following table 1.

Table 1: Evolution of the amount invested in the seed stage by recorded venture capital funds (EVCA) and business angel networks (EBAN)

European seed industry	**2005**			**2006**			**2007**		
	EBAN	**EVCA**	***% EBAN***	**EBAN**	**EVCA**	***% EBAN***	**EBAN**	**EVCA**	***% EBAN***
Number of deals	653	409	*61*	843	477	*64*	1 111	699	*61*
Amount invested (in thousands of EUR)	130 717	96 497	*58*	149 474	197 704	*43*	184 203	184 693	*50*
Average amount of the deal (in EUR)	200 178	235 934	*46*	177 311	414 473	*30*	165 649	264 224	*39*

Source: based on [6]

3. Potential of business angels in current economic situation

Above mentioned lack of capital available for business activities' funding vary between € 0.5 million and € 3 million in European countries, according to EBAN.[7] There is usually business angels' engagement in SMEs for which is typical high innovation rate and high sales rate, mainly for companies from so-called high tech sectors [12], these ones are sometimes called „gazelles“. This is the way these companies fulfil two of the development's and economic growth's EU priorities – innovations and competitiveness. The third priority is the immanent feature of SMEs as a whole. (Fully in [13]). That is because they represent a stabilizing element of economy in term of employment. For example, there is constantly maintained a proportion of total employment just above 60 % with a gentle tendency to increase in the Czech Republic. [15]

3.1 The European Union support of business angels

For Europe is typical institutional and financial support of business angels' activities. This question is discussed in a number of EU documents, often in relation to SMEs support. [7]

It cannot be left out of consideration that large support to private equity financing has been devoting also in the USA[4]. Legislative regulation had an immediate impact on economy at the same time: there was invested $ 460 billion by 225 venture capital holders in 375 companies in 1979 and nearly $ 4 billion by 700 venture capital holders in 1 729 businesses by end of 1987. [19]

In the European Union it had been the Community Multiannual Programme for Enterprise and Entrepreneurship for the period 2001 – 2005 which was followed by the Community Support Programme for Entrepreneurship and Enterprise Competitiveness for the period 2006 – 2007. The Guide to Risk Capital Financing in Regional Policy of 2002 is focused on improvement of SMEs' access to finance through using different kinds of venture capital tools. The issues of importance of venture capital are also mentioned in the Green Paper on Entrepreneurship and in related document the Action Plan on Entrepreneurship which was published in February 2004.

The EU support for business angels is not only conceptually declarative but there are also some financial resources available from EU Structural Funds and special European programms. [18]

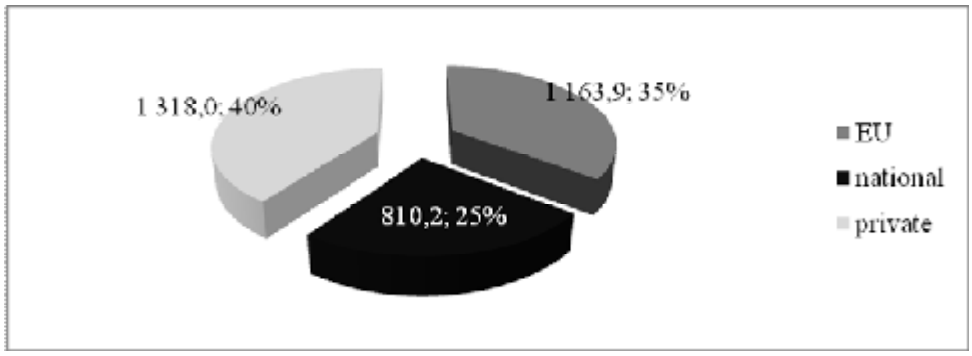
The European Regional Development Fund offered the possibility to finance business angel networks' activities after year 2000. This support was used in their projects by the United Kingdom (the LINC Scotland and the Xenox projects) and by Poland (the Lewiatan Business

[4] This fact show for example regularization elements from the end of 70th and 80th from the last century: [19]

- The Revenue Act (1978): provided capital gains tax incentive for equity investments. Capital committed increased by $556mn from the previous year.
- ERISA's “prudent man” rule (1979): clarified investment guidelines for pension investors to allow for higher risk investments.
- The Small Business Investment Incentive Act (1980): redefined venture firms as business development companies, eliminating the need for registering as an investment advisor.
- ERISA's “safe harbor” regulation (1980): stated that venture managers would not be considered fiduciaries of plan assets.
- The Economic Recovery Tax Act (1981): lowered capital gains rate. Capital commitments doubled to $1.3 bn in 1981.
- The Tax Reform Act (1986): reduced incentive for long-term capital gains.

Angels). There operates the INTERREG initiative as a part of ERDF with the aim of the support of cross-border cooperation which was used for example in the EUBAN project by Germany, by the Netherlands or by Belgium; in the WABAN project by Belgium and by France. The European Social Fund provides opportunities to improve training courses provided at regional level; Sweden (KISTA) and Spain (ABANT) have taken an advantage of them. Then are used – to strengthening the knowledge-based business angel networks above all – European programms as the Leonardo (the I-CUBED project), the Cluster programme (the AFIBIO project), the PAXIS programme – the Sun&Sup project (Finnish project the Sitra; British project the Exemplas, German project the Netzwerk Nordbayern) or the INNOCOACH programme. Currently is a specific part of financial resources connected with the JEREMIE project.

Volume (in mil. EUR) and proportion in expenditure on risk capital financing divided into separated resources in EU 15 in the period 2000 – 2006 illustrates following graph 2.



Graph 2: Estimated Expenditure on Risk Capital Financing in Structural Funds Programmes (based on[10])

The ERDF cofinancing planned on Risk Capital Financing has doubled from the estimated € 570 million during 1994 – 1999 to approximately € 1200 million in the current programme period. Total expenditure during 2000 – 2006 is approximately € 3300 million.

For the period 2007 – 2013 is one of the most important programms involved with business angels the so-called CIP (the Competitiveness and Innovation Framework Programme), completely new set of instruments which provides over € 1 billion to support SMEs' access to finance, a substantial amount of it channelled via the EIB Group. [20]

Awareness of importance of support for SMEs' access to financial resources, to venture capital above all, shows also the recommendation of the European Commision in the part VI "Small Business Act" for Europe [20]: "The EU and Member States should facilitate SMEs' access to finance, in particular to risk capital, micro-credit and mezzanine finance and develop a legal and business environment supportive to timely payment in commercial transactions." There will be provided about € 27 billion for SMEs' support in terms of fulfilling the EU cohesion policy and within this amount more than € 3 billion through venture capital by end of 2013.

3.2 Business angels and their behaviour in times of crisis

It is understandable that busines angels don't stand apart from economic processes and their consequences connected with the financial and economic crisis. Contrariwise, some of them feel the impacts of crisis a lot, they suffered a loss of their investments. On the other hand, the ones whose financial resources are sufficient have much more opportunities today and these opportunities are very attractive. Besides, demand for their investments appreciate also

business angels' engagement in terms of sharing their managerial and entrepreneurial experience. It's a generally true fact that price decline belongs to one of the economic crisis' symptoms. On the one hand it means inaptitude for exits, on the other hand it may stimulate investments characterized by lower volume of capital and by higher profit rate. Morover, economic recovery calls for investments and with a view to inelasticity of banks, their focus on providing small and easily enforceable credits to their solvent clients and necessity to document clients' business history for receiving a credit, private equity financing appears to be a solution.

There was launched a new business angels' initiative in the Czech Republic, investors are setting up „an angel bank“ the Credo Ventures with planned deposit of 0.5 billion CZK [3]. It's a clear evidence of the fact the investors are convinced of investments' potential even on such level which calls for innovation in the area of private equity financing's instruments. Purely informal venture capital has been turning into formal venture capital in a certain manner. The fund should consist of both private and institutional resources; shareholders would be involved as silent partners or actively. The Credo Ventures should not offer only finance but also consultancy, mentoring, intermediation of contacts, it is operating as standard business angels.

The fact there isn't lack of projects on the demand side illustrates a brief overview in table 2.

Table 2 An overview of offered projects for business angel investments in the Czech Republic till 29.9.2009

Industry	**Specify**	**Investment size (EUR)**	**Share proposal**	**Turnover (EUR)**	**EBIT/I**	**Years in Business**
Real estate	e-commerce	25 000	50 %	90 000	n.a.	15
Health	fitness	150 000	50 %	1 100 000	20 %	15
Bookstore	e-commerce	100 000	40-60 %	300 000	15-20 %	15
Internet	web-games	80 000	33 %	400 000	65 %	15
Construction	new material	50 000	60 %	400 000	n.a.	15
Entertainment	video on demand	1 000 000	50 %	500 000	20 %	5
Ceramics	Hand deco-rated ceramics	300 000	40-50 %	500 000	15-20 %	15
Wood	parquet	220 000	34 %	n.a.	n.a.	n.a.
Construction	construction material	200 000	30 %	n.a.	n.a.	n.a.

Source: based on [1]

The table shows that demand for investments is related to industries which usually are connected with business angel investments (more specified in [17]) – IT, materials, health. The applicants' history is 15 years in most cases. Demanded investment size is usually the amount from € 25 000 to € 300 000 in the Czech Republic (an exception is an investment in the amount of € 1 million but even this one isn't beside European dimension – see above),

proposed share is from 30 % to 60 %. The EBIT rate (if it's featured) is usually between 15 % and 20 %, an except is a project focused on internet games with its 65 % appreciation.

3.3 Barriers to development of business angels' activities and their removing

Although private equity financing appears to be an useful and effective form of investing and a way to ensurance capital sufficiency then, informal capital as business angel investments are above all, there still remain some barriers which obstruct further development of private equity financing although there are many declared supporting measures both at the EU level and in individual countries, including the Czech Republic.

The Risk Capital Action Plan [5] has identified six categories of barriers that hinder the development of risk capital markets in Europe. These categories are:

- market fragmentation,
- institutions and regulations,
- taxation,
- paucity of high-tech SMEs,
- human resources,
- culture.

The aim of the Risk Capital Action Plan is to remove these barriers to allow the development of a true Europe-wide risk capital market.

As the worst barriers to development of Czech venture capital investments are considered [3] for example: impossibility of adapting the internal relations of join stock companies and private limited companies for needs of investors; investors can be separated into categories by hands-on and hands-off approach only partly and with difficulty, institutional investors are considerably limited in venture investments. There is huge lack of tax incentives for venture capital - with a view both of income tax and value added tax. The SMEs' development is insufficient whereas such enterprises are the most frequent objects of business angels' activity; there isn't any systematic subvention which would have a form of taxation or fiscal incentives for young and perspective companies, any subvention for their innovation potential, for example it could be a possibility of tax-deductible costs of transfer of technologies for developing enterprises.

In this respect, the White Paper, published by EBAN [5], is very inspiring, this book arranges four categories and four levels of measures in a matrix way. The categories include supply issues, demand issues, environment issues and taxation issues; the levels are differed for the EU level, national/regional authorities, business angel networks' level and EBAN level. In a matrix way, there are elaborated 9 fields of measures then:

- leveraging untapped investment potential and activating virgin angels,
- growing the informal venture capital marketplace,
- addressing the constant need to raise stake value,
- improving investment readiness,
- strengthening the dialogue between business angels and venture capitalists,
- improving the partnership among regional stakeholders of support for entrepreneurship,
- visibility,
- regulation,
- amending tax regulations applying to investment by business angels and other private investors.

For example, there are measures for the national/regional level on the supply side focused on tax privilege for business angel investments, on financial support of business angel networks' setting up and on administrative demands' simplification. For the demand side is recommended to develop and to deliver investment "readiness" training to entrepreneurs looking for any form of equity above all.

In light of SMEs environment, there is needed benchmarking of importance and effectiveness of SMEs as funded subjects. In the category taxation, there's the most emphatic demand for audit of tax treatment of investments by private individuals in unlisted start-ups. At the same time, the Ministries of Finance of the EU Member States should endeavour: „… to raise public awareness of the economic role of business angels in order to provide political justifications for such tax incentives."[5]

4. Conclusion

Private equity financing has an irreplaceable role in economic recovery today but its importance has even in economy boom. Private equity are resources intended for appreciation, they're supposed to bring money to their holders. It represents a priori very efficient form of financing which evaluates and accepts an optimal risk ratio, profitability ratio and liquidity ratio individually. Its efficiency arises from a simple premise among others: capital owner decides about his or her resources for his or her benefit. Providing that economic behaviour is rational, it's the most efficient decision situation.

With this characteristics of private equity, with business angel investments concretely, agrees a relatively dynamic development all over the world, including also the Czech Republic, which hasn't been affected by consequences of current financial and economic crisis. On the contrary, there can be mentioned some chances and new opportunities in many respects.

But what remains the controversial issue is institutional and financial public support of private equity financing. The sense of government's intervention (or supra-state interventions within the meaning of the EU level) is elimination of market failure. Each intervention inffluences sensibly acting economic subjects. With regard to the principle of private equity financing and business angel investments can be submitted that direct support appears to be redundant. It would be a mistake to let it become and remain in being some weak economic elements and sub-optimal efficient solutions. But what has the highest importance is to remove barriers occuring in the area of taxation and legislative regulation which obstruct higher involvement of this form of financing and capital sufficiency ensurance.

Another question is volume of support for the target objects of venture capital, i. e. SMEs. Regarding the role of small and medium-sized enterprises in national economy, there may be evaluated their institutional support, focusing on technological progress and on innovative entrepreneurship, as desired today – especially on conditions of glabalization and in term of market structures. Still has to be applied institutional support's tools circumspectly in such a way to not break economic competition and to not create unefficiency in economy.

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COMMUNITY PLANNING OF SOCIAL SERVICES IN THE CENTRAL BOHEMIA REGION

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Abstract: *The community planning of social services (CPSS) method focuses at planning the development of social services at a local and regional level. CPSS ensures the effective functioning of social services and allows for the efficient use of funds. The goal is to provide accessible services at a level of higher-quality, which respond to the current needs of users and are transparent, with funding allotted only to those services which are really needed etc.*

Keywords: *Community Planning, Social Services, Central Bohemia Region, Community Planning Method, the Law on Social Services, Development Plan, Planning Process.*

1. Introduction

Community planning is becoming one of the necessary techniques or methods of decision making in the 21st century, where the concerned parties are involved in the heart of the decision-making process. Community planning is an instrument which actively engages the public by involving them in the decision-making process for a given location and may pertain to any essential area such as social services, public landscaping, cultural events, social activities, and many others. The process itself naturally has certain methods and procedures which must be followed to achieve the intended outcomes of community planning.

In this article we will primarily examine community planning for social services in the Central Bohemia Region and focus on the process of planning the development of social services.

2. History of the community planning method

Community planning in the Czech Republic dates back to the passage of Act no.108/2006 Coll., on social services, as subsequently amended, although prior to this there had already been instances in the Czech Republic of community planning which focused on local problems. A good example of this is the statutory city of Ústí nad Labem, which has been community planning since 1995. Today, the regions are required to plan the development of social services through medium-term plans for the region in cooperation with towns, the providers of social services, and users. The method upon which this process is to be based is the community planning method.

3. The law on social services and the community planning method

The community planning method, as it relates to social services, is founded on the following principles: emphasis on the active role of the users of social services and representation of their interests in the planning process; involvement of a wide range of people, emphasis on negotiation, and empowerment of the public to supervise the decision-making process, as well as implementation of the community plan itself.

Act no. 108/2006 Coll., on social services, as subsequently amended *(hereinafter the law)* introduces **fundamental obligations with respect to social service development planning**.

As a result of the passage of amendment no. 206/2009 the following changes have been made (effective as of 1.8.2009): in §3 let. h) the basic framework of the medium-term plan is defined, i.e. : ... *the result of the process of actively determining the needs of persons in the specified area and seeking means for meeting these needs using available resources, the content of which is the description of the manner of preparing the plan and analysis of existing resources and needs of the people for whom the social services are intended, including economic assessment, strategies for providing and developing social services, obligations of participating subjects, the manner of monitoring and assessing fulfillment of the plan, and the manner in which changes may be made in the provision of social services.*

The region is required to prepare (pursuant to §95 let. d): ... *a medium-term development plan for social services in cooperation with the municipalities of the region, with the representatives of social service providers, and the representatives of persons to whom social services are provided, and to inform regional municipalities of the results determined in the planning process; to take into account when formulating the regional plan all information provided by the municipalities according to §94 let. e), as well as data entered into the registry according to §85 par. 5.* Additionally, it is required to monitor and assess (§95 let. e) ... *fulfillment of the development plan for social services with the participation of representatives of social service providers and representatives of persons to whom social services are provided, and municipal representatives.* The region ...*shall inform the ministry of fulfillment of the social service development plan* (§95 let. f) and also *ensure access to social services provided within its territory in accordance with the medium-term social services development plan.* The following paragraph of the law (§96 let. b) also sets forth the obligations of the ministry, which *prepares a medium-term national social services development plan with the participation of the regions, representatives of social service providers, and representatives of persons for whom the social services are provided.*

An integral component of requests for regional subsidies from the state budget is the medium-term social service development plan appendix (§101, par. 4, let. b), which also contains an economic analysis of the needs identified in the plan and their manner of funding. The subsidy itself is provided for financing standard expenditures associated with the provision of social services in accordance with the prepared medium-term social service development plan (§101, par. 2) and the amount of this subsidy is determined based upon the prepared medium-term social service development plan (§101, par. 5, let. b) which gives a list of the social service providers (§101, par. 3, let. c) for which the subsidy is requested, in accordance with §95 let. g).

Additionally, in § 2 the law on social services defines the national priorities which social services must meet. These are:

- to preserve human dignity,
- to be based on individually determined needs,
- to foster independence,
- to foster social integration
- to provide assistance and support of appropriate quality,
- to ensure the preservation of human rights and basic freedoms.

Czech Government Decree no. 824 of September 1st, 2004 – this government decree regarding the strategy for supporting the availability and quality of public services **requires**

individual ministries to use the community planning method when addressing questions of the availability and quality of public services.

4. The community planning method

As implied in the name itself, this approach is based on certain communities of persons who are joined together by some particular thing. If we are speaking of community planning at the municipal level, then this will entail all the citizens of the given locality/municipality. We may also define a community based upon the common values, cultural heritage, common interests or shared problems of people. The structure of a community may thus be founded on formal or informal groupings. Perhaps the closest conceptual construct for community planning in the Czech Republic is a community formed based upon the perception of the common good. Community according to this definition is something which can be achieved through the efforts of citizens, not something which is given through geographical conditions. Community thus takes on dimensions no longer represented by mere statistics. Planning in such case means a process, which in fundamental aspects differs from other methods of strategic planning. Community planning is founded on basic principles, where unconditional emphasis is placed on the active participation and role of the users of social services (in the area of social services), on the inclusion of a broad range of people and other professionals who are knowledgeable in the given area, and where the conclusions arrived at during planning must subsequently be tested against the wishes, needs, and interests of citizens. The process itself is accompanied by often lengthy negotiations of all interested parties and public supervision over the decision-making process and subsequent implementation.

Three parties are involved in the decision-making process of community planning for social services (clearly the most widespread area of community planning in the Czech Republic). These are: the public along with the users of social services, the providers of social services, and the contracting authority (representatives of the municipality, region, etc.). All of these parties should be guaranteed equal rights. For this reason, we often speak of the triad.

The community planning process should be broken down into seven basic phases:

1. preparation for bringing all partners into the community planning process,
2. creation of organizational structures,
3. determination and analysis of needs,
4. definition of goals, priorities, and measures within the scope of the given area,
5. drafting of a final community plan,
6. implementation of the proposed goals in the plan,
7. general and ongoing evaluation.

To maintain the basic principles of community planning, before beginning the community planning itself we must first address the public, as well as the political representatives of the given area. Even in these initial stages we may encounter our first problems. For a community plan to be carried out in practice, it is important to be prepared for skepticism of the process itself. If the process is initiated from below (by the public), then this initial stage often takes considerable time before it gains political support. If the process is instituted from above (from the contracting authority – region, town etc.), then the process is easier. Nevertheless, it is necessary to focus on communication with municipal or regional politicians and explain to them the ways in which the community planning technique is important.

Also important is the proper and effective inclusion of social service providers. It is good to explain to them that participation in the community planning process gives them opportunities to make suggestions for solving the social service challenges in the given area, to support the introduction of new necessary social services, and it puts them inside the process where they can influence political decisions as well as the allocation of the funding which affects them. The community planning process thus ensures the development of necessary social services which react not only to demand, but also the particular local conditions and time constraints, therefore more effectively meeting the needs of current and future users.

Inclusion of active social service users is at the foundation of the community planning process. It is also the most difficult component, along with maintaining the participation of these users over the long term. Here in particular, personal communication with the users of social services is most effective. Users may be addressed directly (telephone surveys, advertising in local papers, internet surveys etc.) or indirectly through the provider (for example people with addictions). It is absolutely essential to use simple language which users will understand. Avoid technical terminology which users, unlike the providers and the contracting authority, will not understand. Also, it is essential to provide users with sufficient information on the community planning process.

The general public may be included through process consultations, information campaigns, the collection of community plan comments or the organization of public meetings together with the providers, etc.

The composition of organizational structures is often different, even though in certain aspects organizational structures are similar. Important differences may be found in the rules for decision making and approval, in the position of the community planning coordinator, and the functioning of the triad. The generally recommended practice is to create work groups for individual groups of users (such as seniors, persons with physical disabilities, etc.) upon whom the community planning process is focused. The work groups should be open and should include representation for the contracting authority, the providers, and the users. In most cases, a steering group is created, often comprised of political representatives. This group processes the comments, suggestions, opinions and proposals from the work groups and works these into a final version to be submitted for comments from the members of the work groups. In the final phase, the steering group submits a final version of the community plan for approval by political representatives.

For the actual planning of specific activities to occur, it is first necessary to map, describe, and analyze current resources for providing social services. One must determine what kind of services are currently offered, at what quality, cost, and to whom. Furthermore, what kind of social situation is perceived by the public or municipal representatives, what kind of plans are envisioned by service providers, and additional information. This information may be obtained through polls, questionnaires, interviews, or telephone surveys. This enables one to obtain an overview of the services provided, details about individual services (e.g. overviews of funding allocated to social services, sources of funding, costs for individual services etc.).

After mapping the current situation, shortcomings, and needs for social services comes the phase where all participants must answer questions: What kind of services do we want to have? What do we want to attain (vision, goals), on what level, for how long (plan, timeline), with the help of what (available resources), by what steps (activities, measures) and who will take these steps (who will carry out the measures, who will be responsible, who will evaluate)?

5. Possible pitfalls of community planning

As is evident from the aforementioned principles, great emphasis is placed on the ability to freely express opinions and the need to ensure a non-discriminatory approach. In practice this may result in friction, conflicts, or additional problems in communication. The needs and goals of the political representatives of the given locale, the providers of social services, and their users all exert pressure on one another. Even if each of these participants has different needs, a clear goal should always remain within view, namely an improved and higher quality life for local inhabitants.

If we understand community planning to be the ability to involve the public in the decision-making process, we must take into account the fact that just about anyone can put their two cents in regarding important matters, even those with insufficient qualifications and education to address the given matter, or those who are combative. Further, we must not forget that the people who become involved in this process may know each other personally. These personal relations may have both a positive impact, as when exchanging experience, or a negative impact, as when seeking consensus.

For these reasons it is necessary to include additional subjects in the community planning process, people who already have experience in public involvement, project management, economics, and community planning. Such well targeted methodical support may help avoid possible obstacles from the very beginning. During meetings between what is often a very large and diverse number of people, it is important for someone to lead the discussion. A good facilitator or mediator may be a great boon during negotiations and particularly in attaining very important joint consensus.

Another obstacle may be the financial demands of the process. Even if in most cases there are no objections to participation in work groups, the process itself requires considerable funding. The primary cost is the wage for the community planning coordinator, while additional funds are required for contracting various types of analyses to examine the current situation. Here, it is necessary in advance to define what is to be determined. Socio-demographic data can be determined by the organization/office itself (especially if it uses resources such as ČSÚ, MPSV and others), but for benchmarking costs, it is good to get an expert. These analyses can run from one hundred thousand up to a million crowns. For these reasons, it is good to count on the possible use of these analyses for future periods.

6. The Central Bohemia region and the social service development planning process

The Central Bohemia region began the community planning process in 2005. The first medium-term social service development plan was compiled and approved in 2007, and was created for 2008 – 2009. Presently, approval is underway of the 2nd medium-term social service development plan for 2010-2011.

The organizational structure for planning social service development in the Central Bohemia region consists of 6 basic work groups which focus on 6 basic social areas (seniors; families, youth and children; persons with physical disabilities; persons at risk of addiction; persons at risk of social exclusion; persons experiencing temporary crises). These work groups are made up of providers, users, and representatives of KÚ SK (the contracting authority).

Newly created in the organization structure is the professional work group consisting of representatives of towns, the association of towns and microregions in the Central Bohemia

region, who are already using community planning, and the KÚ SK interdisciplinary group which assesses and provides feedback on goals or analyses in individual fields (finance, education, social affairs, and health care) and also actively shares in creating this strategic document.

For the plan itself to be more than just a formal document, political support of the entire process is necessary. For these reasons a Regional Coordination Commission has been created, headed by the councilman for social affairs. This commission is incorporated into the organizational structure of the entire planning process and by its statutes has become a permanent advisory body and initiator for the councilman for social affairs.

The most important step in 2009 was updating the current plan for 2008-2009. Participants in the social service development planning process came together at a meeting with experienced facilitators where they updated the current goals and measures and sought to define the positives and negatives in the Central Bohemia region with respect to the availability and quality of social services. These updated goals and measures were implemented into the updated plan for 2010-2011 and underwent the comment and review process.

The basic concept of the plan along with goals and measures was publicly disclosed on the region's website in July 2009, where participants in the process as well as the general public could submit comments. After considering and incorporating these comments, the plan was submitted to the Committee for Social Affairs (approved on 25.8. 2009), after approval it was submitted to the Regional Board (approved by Ruling no. 075-31/2009/RK of 31.8. 2009) and ultimately it will be submitted to the Regional Assembly for final approval.

The most important activity in updating the current medium-term plan for 2008-2009 was the renewal in work groups of individual goals and measures. Additional activity, especially in the interdisciplinary group, involved the centralization of the individual outputs from the various activities and analyses of the Regional office, which provided important material for this document. Also used were the results and requests from individual towns (level III) which participated in the community planning process. All of the goals set forth in the medium-term social services development plan for 2010-2011 were analyzed with respect to all available municipal community plans. From this analysis it was determined that no fundamental goals for social services were missing from this list.

Practically the entire organizational structure which took part in creating the social service development plan adhered to the established methodology (Methodology for planning social services MPSV 2007) as well as the MPSV criteria for quality social service planning, which was used as a basic framework for the work itself and the compilation of the plan.

7. Conclusion

Community planning is a process which requires a certain amount of courage from local government. During community planning the public gets the change to actively express itself regarding happenings in the given locality. Nevertheless, community planning can yield great benefits (provided the established goals are achieved in practice).

The community planning of social services (CPSS) method aims at planning the development of social services on the local and regional level. CPSS thus ensures the effective functioning of social services and enables efficient use of funds. The goal is to provide high-quality, accessible services which respond to the current needs of users and are transparent, with funding allotted only to those services which are necessary, etc.

The most salient characteristic of community planning is the emphasis placed on the inclusion all parties affected by the area in question, on partnership, dialogue and negotiations, and on achieving results which are acceptable and supported by the majority of participants. The chief participants in the community planning of social services are municipalities or regions as the contracting authority, the providers and users of social services, and the public.

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PREVENTION OF UNDESIRABLE SITUATIONS IN CONNECTION WITH ILLEGAL HANDLING OF HAZARDOUS WASTE

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Abstract: *Waste management is a rapidly developing area of the national economy. Developed countries have begun to address waste management intensively only in recent years. In the Czech Republic the first law on waste was made until 1991. Hazardous waste can harm human health or the environment, and therefore is needed to pay attention to it. The negative effects of hazardous waste can occur in the place of its origin, when transporting it or close to the place of the removal.*

Keywords: *Waste Management, Nalžovice, Hazardous Wastes, Environment.*

1. Introduction

Waste management is a relatively young but dynamically developing field of the national economy. Industrially and economically advanced countries started to intensively deal with the issue approximately 20-30 years ago, and the Czech Republic received its first legislation on waste management as recently as 1991. Prior to 1991 there were no legislative checks and controls in place concerning the handling of waste, and no integral regulations existed apart from the management of secondary raw materials.

In particular, handling hazardous waste is similar to handling highly toxic substances or chemical substances. Hazardous waste must possess at least one of the hazardous properties indicated in Annex 2 to Act No. 185/2001 Coll., on Wastes as amended (hereinafter the "act on wastes"). The hazardous properties of wastes include e.g. toxicity, carcinogeneity, mutageneity, infectiousness, ecotoxicity, etc. Quotable examples of hazardous wastes include the wastes of polychlorinated biphenyls (PCB), persistent organic pollutants (POPs), as well as infectious health care wastes or wastes containing mercury or wastes from production cycles using hazardous chemicals.

Hazardous wastes may be harmful to human health or the environment, and should be the object of increased attention. The negative impacts of hazardous wastes may occur in the course of their production, transport and disposal near the site of their origin. In 2006, several localities were identified where dangerous substances and hazardous wastes were incorrectly and illegally stored and handled. This paper will be focus on the above findings, on possible remedies to solve effects, and on eliminating these effects within the existing legal framework. Due to the complexity of our topic the paper will be focus on to the hazardous waste that seriously impacts public health and may impair the state of the environment.

The paper aims to point out the risks that may occur due to the nonobservance of the rules of processing, transportation and storage (handling) of dangerous wastes, and the nonobservance of applicable regulations pertinent to this issue.

2. The Current state of the problem

Waste is classified dangerous in accordance with Section 6 of the act on wastes, whereby a dangerous waste shall have been:

- included in the list of dangerous wastes in accordance with Regulation 381/2001 Coll., on the Catalogue of Wastes, List of Hazardous Wastes, and Lists of Wastes and States for the Purpose of Export, Import and Transit of Wastes, and Procedure of Granting Consent to the Export, Import and Transit of Wastes (Catalogue of Wastes),
- mixed or polluted with any of the wastes indicated in the List of Hazardous Wastes,
- mixed or polluted with any of the items indicated in the list of wastes that render waste hazardous in accordance with Annex 2 to the act on wastes,
- considered if the waste has one or more hazardous properties in accordance with Annex 2 to the act on wastes.

Every year the Czech Republic produces more than 1.5 million metric tons of hazardous waste. Although its production has been steadily declining, this type of waste, if improperly handled, is a certain risk to the environment and public health.

2.1 Definition of hazardous waste and relevant context

In accordance with the act on wastes, everything one disposes of or intends or is obliged to dispose of, and listed in one of the waste groups cited in Annex 1 thereto is waste. There are two basic categories of waste: Hazardous Wastes – NO and Other Wastes – OO.

A hazardous waste is cited among others in the List of Hazardous Wastes in accordance with Regulation 381/2001 Coll., on the Catalogue of Wastes.

At present, hazardous waste is waste with one or more of 14 decreed dangerous properties, namely: H1 explosiveness, H2 oxidation capacity, H3-A high flammability, H3-B flammability, H4 irritability, H5 harmful to health, H6 toxicity, H7 carcinogeneity, H8 causicity, H9 infectiousness, H10 teratogenicity, H11 mutageneity, H12 ability to release highly toxic and toxic gases in contact with water, air or acids, H13 ability to release hazardous substances to the environment during and after their elimination, H14 ecotoxicity

Input information for one to grasp the severity of the hazardous waste problem could come in the following three parts:

1. Wastes and the biosphere

2. Hazardous wastes and humanity

3. Harmful substances in hazardous wastes

Much hazardous waste comes from industrial waste (various chemicals, printing and metallurgical heavy metals, pharmaceutical refuse, sharp glass objects, miscellaneous food industry artifacts); agriculture (various pesticides, industrial fertilizer residues), civil engineering (some building materials contain asbestos, paints, varnishes, artificial resins and radioactive substances), transport (oil products, mineral oils, tires), trade (refrigeration equipment, food past its useful life, spoiled food), health care (unused medicines, sharp objects), and offices (spent electrical equipment, printer toners). All of the above fields produce countless other hazardous wastes and sometimes dangerous substances are the byproducts of decomposition of various materials.

The hazardous waste in the above cases originates from legal entities, companies, establishments, etc., or private businesses; these private persons and businesspeople are obliged to ensure proper waste management and waste disposal. Very strict regulations are in place regarding the handling of hazardous waste.

Only persons properly authorized in accordance with the act on wastes are permitted to handle hazardous wastes. An originator of hazardous wastes, i.e. a legal entity or a physical entity whose business activities generate wastes, may handle such wastes only with the consent of the applicable state administration body. Permits to handle hazardous wastes are granted by regional offices (in case of quantities over 100 tons per annum), and by the local authorities of municipalities with extended powers (in case of quantities below 100 tons per annum). Wastes may be handled only by establishments designed for the purpose and fully licensed to operate applicable equipment.

2.2 Waste in general

As long as man crafted his products exclusively from natural materials, i.e. wood, leather and plant and animal parts, all the recycled residues were gradually eliminated in such conversion cycles. They would decompose and materials obtained from minerals (metals and nonmetals) were deposited in earth, as evidenced by the unearthed foundations of ancient cities as well as artifacts created by people hundreds and thousands of centuries ago. In accordance with the natural relationships thus defined there was also an agriculture that provided food to the human society from its inception in the Neolithic revolution until the 19th century. But even in the 19th century, agricultural yields depended, alongside the natural conditions (land fertility and climatic conditions) solely on the amount of invested work of people and animals in field works, land reclamation, and returning organic matter to land in the form of farm estate manure.

During this developmental period, the waste problem became urgent only if a lot of organic refuse was collected in one place, its stench became overwhelming and there proliferated the organisms that feed on garbage and spread contagious diseases.

However, a different situation arises once alien (artificially produced) substances start cropping up in a natural environment which has no indigenous organisms to feed on and decompose them. The problem is further aggravated if these substances are toxic or otherwise dangerous to organisms and damage or disrupt the ecosystem relationships, and thereby endanger man.

2.3 Hazardous waste then and now

The first problems associated with hazardous waste began to appear in the period when people zeroed in on the cities where much refuse was gathering, especially excrements and food. That attracted many consumers (rodents and insects) that tended to spread infectious diseases. Polluted ground water and stinking air made people, still unaware of the true cause of contagion, want to call for sewage being somehow removed from cities and water wells. Time and tide, informed by the path of civilization, has helped promote the elimination and reduction of the impact of hazardous waste. Step by step, sanitary measures were introduced to prevent the accumulation of organic waste and to protect clean water.

But from the global point of view the human society worked in a rather differentiated and uneven way to forge a brand new approach to the environment. Thus, we keep exploiting natural resources we need to feed us and fashion things, but we are doing it on an

unprecedented level. The abundance of energy (mostly from fossil fuels), together with the advance in chemistry has helped us to produce chemical fertilizers and many substances, which never occur in nature and there are no organism ready to decompose them.

The cyclical character of relationship towards nature and original man-environment rapport has changed in favour of a one-way relationship.

The Industrial Revolution brought about major changes in the use of natural resources, in the way of life and also changed the nature of the waste very much. Entirely new types of waste appeared, particularly waste of dangerous chemical nature, in other words waste containing hazardous substances dangerous to the biosphere and human health. Hazardous substances, which accumulate in the environment, are not only pesticides. Various industrial wastes discharged into water or in the air, waste leached to land from badly designed based dumps or from old abandoned industrial plant, etc. can have similar influence on the environment.

3. Analysis procedure of the region and the measures taken in connection with illegal handling of hazardous waste

3.1 Description of actual emergency situations

In the course of 2006, three illegal chemical and hazardous waste dumps were discovered in three regions of the Czech Republic. Specific finds were made in the municipalities of Libčany (Hradec Králové Region), Chvaletice (Pardubice Region), and Nalžovice (Central Bohemian Region).

In the first case, Police of the Czech Republic discovered hazardous substances in Libčany (Hradec Králové Region). At an emergency session of the Regional Security Council and invited guests, the Governor of the Hradec Králové Region declared, on the request of the Lord Mayor of the Statutory City of Hradec Králové, a "state of emergency" in a limited part of the territory of the Libčany Municipality due to a "considerable threat to life, health and the environment in connection with the quantity of dangerous substances and preparations, deposited by unidentified entities and discovered on the property of the firm, SNOG HK, s.r.o., in the territory of Libčany, and due to possible threats that cannot be averted by routine action on the part of the administrative authorities".

In the second case stated above, the Police of the Czech Republic found dangerous substances in Chvaletice (Pardubice Region) in the course of investigating an industrial accident, involving one person and caused by an explosion when handling glass packaging material on the property of the firm, AVOT spol. s.r.o. (in liquidation). However, an emergency session of the Pardubice Region Security Council failed to find a legal justification of declaring a state of danger as proposed by Přelouč Municipality with Extended Powers.

The third above case relates to the Central Bohemian Region, where a local mayor indicated the presence of dangerous substances in Nalžovice. Analogically to above, an emergency meeting of the Central European Regional Security Council failed to find a legal justification of declaring a state of danger and consequently the Council did not recommend that the governor declare an emergency situation but proposed that the incident be solved by administrative bodies and IZS (Integrated Rescue System) components.

It is up to the authorized public administration bodies to evaluate situations and select policies and methods of solving situations. As a rule, public administration bodies rely on their advisory and operative segments, established on the basis of legislative provisions and

consisting of experts and specialists capable of recommending the adoption of adequate measures in cases of direct threat to life, health, property or the environment. The policies chosen and adopted by the Pardubice and Central Bohemian public administration bodies represent a suitable solution to the problem, inasmuch such solutions led to results identical to those achieved by the Hradec Králové Region, based on coordinated action by individual administrative bodies and the components of the Integrated Rescue System (hereinafter the "IZS"). Due to the fact that this was the first such incident reported in the Czech Republic, it was quite difficult to assess the legitimacy or justification of declaring such state as a purposeful and pragmatic move that could have pursued several goals at once, i.e. to quickly select a contractor, to provide funding, to coordinate action from a single command post, etc.

The approach taken by the Hradec Králové public administration bodies to the issue of illegal dump store, and their declaring a state of danger, was legitimate from the vantage point of legislative regulations. However, the imposition of a state of danger and the application of emergency measures should be resorted to only in boundary situations involving the immediate risk to the lives and health of the population, and to property and environmental conditions where such threat cannot be averted by routine action on the part of administrative bodies and ISZ components.

In the case of tackling emergencies in accordance with the provisions of Act No. 239/2000 Coll., on Integrated Rescue System and Amendments to Certain Acts (hereinafter the "IZS Act") involving the deployment of ISZ components, the command officer has sufficient powers to cause the solving of a situation to smoothly align with the elimination phase implemented by a specialized company. The command officer may for example ban or restrict persons from the site of action, order the exclusion of a person whose presence is not vital, order the evacuation of persons, and if needed also impose other temporary measures in order to protect lives, health, property and the environment. The command officer may also order the immediate execution or elimination of buildings and site modifications in order to mitigate or avert risks due to an emergency situation, and request that legal and physical entities provide personal or material assistance. It is essential, from this vantage point, that the administrator of coordination of preparation for emergency situations, i.e. the Ministry of the Interior or the General Directorate of the Fire Rescue Service of the Czech Republic (GŘ HZS ČR) include the experience based on the implementation of policies applied in tackling emergency situations in a system of professional training of crisis management bodies, and possibly also propose methodological solutions for decision-making purposes.

However, the main thrust for solving the above situations was limited to procedures within the framework of routine activities by administrative bodies and the funding of the measures adopted, whereby applicable legislation fails to provide sufficient instruments to achieve quick and effective solutions to the above-indicated illegal handling of chemicals and wastes on a large scale. The process of detecting the said illegal actions and the supervision of associated commitments to be met by originators of wastes or users of chemical substances is fragmented in terms of legislation (see legislation concerning the environment, small holdings and building contractors, criminal and crisis management legislation, protection of public health, fertilizers, veterinary practice, Labor Code, etc.), and it not easy for the above administrative bodies to find their bearings on various cases and make appropriate decisions.

The funding of adopted measures to eliminate the consequences and threats of the said illegal activities is generally entrusted by legal regulations to the bottom-level state administration bodies (municipalities with extended powers and possibly also regions), which

incurs additional outlays to their budgets and in the above cases, said bodies were unable to finance adopted measures to eliminate the consequences of illegal activities, and the efforts to seek compensation for their financial costs from perpetrators are usually counterproductive.

3.2 Case study Nalžovice

The article also focuses on specific safety assessment, risk assessment, process and addressing the removal of illegal storage of chemicals and waste in the municipality Nalžovice in the Central Bohemia Region. The chapter was also based on document "Safety and feasibility project" as prepared by DEKONTA of 16 January 2007 [3].

3.3 Input information

Having investigated a former pig farm near Nalžovice in the Sedlčany area, the Police of the Czech Republic discovered a quantity of unidentified chemical substances and duly summoned a Central Bohemian Fire Rescue Corps to the scene. According to the estimate of the team's experts, there were tens of thousands of materials stored on the site that was described as extremely hazardous waste. The chemicals were stored in miscellaneous containers without any classification whatsoever. Some of the materials could be combustible. At that moment, the relevant public administration bodies were materially adviced by the Central Bohemian Fire Rescue Service that there was **no imminent danger**. However, it was necessary to prevent the access of any third persons and possible manipulation of the dangerous materials. Having discussed the affair at an emergency session of the Central Bohemian Regional Security Council, the Governor decided to cope with the situation in coordination with administrative bodies and IZS components and not to declare a state of danger. The crucial measures adopted included around-the-clock police surveillance and protection of the site, a closer probe launched by the Central Bohemian Fire Rescue Service to rule out the presence of radioactive materials, and following essential negotiations with specialists concerning the presentation of a proposal for further action to identify and take stock of the hazardous substances and providing for their elimination, to propose further action with emphasis on safety.

The administrative bodies concerned faced the critical task of coping with the legal and ownership issues of the owner of the Nalžovice site and of the items (chemicals and wastes) deposited on this property. The chemicals were the product of the owner's business activities and most of them had been relocated here from a leased property the owner was supposed to vacate. The owner produced six business permits, some of them covering:

- production and import of chemical substances and chemical preparations classified as explosive, oxidizing, extremely flammable, highly flammable, highly toxic, toxic, carcinogenic, mutagenic, toxic in reproduction, and dangerous to the environment and the trading in chemical substances and chemical preparations classified as highly toxic and toxic;
- business activities in the field of handling wastes except for hazardous wastes; and
- business activities in the field of handling hazardous wastes.

The Region proceeded to order a safety and implementation project to identify, take stock of and eliminate dangerous chemical substances and wastes. The project was supplied by the firm, Dekonta a.s., which had previous experience with the elimination of illegal waste dumps in the two previously mentioned instances, i.e. in the Pardubice and Hradec Králové Regions. Their project specifically defined risk factors, planned activities, and safety measures.

In light of the importance of establishing risk factors in eliminating dangerous substance depots for the purposes of identification, inventory and substance removal, as well as setting relevant conditions for public tenders to select the remover of dangerous substance storage facilities and the identification of main sources of danger, I will devote myself in the further sections of my paper to set risk factors, the description of the main sources of danger, and the evaluation of safety aspects of storing hazardous waste and chemicals in Nalžovice.

3.3.1 Identification of risk factors from the angle of redevelopment works

Redevelopment crews face the following risk factors in the course of rehabilitation of a hazardous substance depot:

- highly toxic chemical substances and wastes (including explosive, radioactive, highly toxic, extremely combustible, oxidizing, caustic, and carcinogenic substances along with substances prone to violent chemical reactions when exposed to water and air)
- thermal load
- physical and mental load
- dust

Other factors are less significant and there is no need to further address them. In accordance with the qualitative and quantitative input data, obtained in the course of additional surveys, the work factors and risks will be further précised and continually updated for the entire field of occupational safety, health protection and occupational hygiene (based on continuous safety and hygiene monitoring). Prior to the commencement of works in the locality, working environment quality measurements are carried out in accordance with legislation concerning the protection of public health so as to materially propose the level of protection of intervening employees. The values thus obtained are compared with the permitted exposure limits. The methods of measurement and evaluation are guaranteed by the National Institute of Public Health. In accordance with the working environment characteristics ascertained, individual jobs may be assigned to individual categories. It is expected that most of the works thus performed are classed in the third to fifth category in accordance with Act No. 258/2000 Coll., on Public Health Protection as amended. For safety reasons it is necessary to minimize the number of jobs in handling hazardous wastes (no transloading) and immediately place them in shipment containers. In the event of a very dangerous substance or situation the works are considered an emergency task, inviting the need to use the highest level of personal protection (i.e. pressurized protective suits – OPCH 90 POV, and self-contained oxygen breathing apparatuses). If explosives or ammunition are found, the Police of the Czech Republic must be immediately alerted. In case of discovering substances listed by Decree No. 50/1997 Coll. (implementing the Act on Some Measures Concerning Chemical Weapons Prohibition) or nuclear materials it is necessary to immediately convey such information to the State Office for Nuclear Safety in accordance with Acts Nos. 18/1997 Coll. (“Atomic Act”) and 19/1997 Coll. (on certain measures concerning chemical weapons prohibition). In the event of an emergency situation the procedure is according to emergency regulations. Only nonsparking tools and aids will be used at work.

Stored dangerous chemical substances and wastes pose a grave source of danger. Their dangerous character is greatly enhanced by storing them without heed to elementary safety principles invited by occupational safety and fire prevention requirements. Generally, stores containing hazardous waste come in two categories – one with partly sorted contents and one corresponding to the original emergency. The duty to report the presence of hazardous

substances and their properties is derived from the two categories as stated above. The composition of sorted out and arranged materials is known either precisely or at least in a framework manner. During the exploratory works in the compound, large quantities of various chemicals with a wide spectrum of dangerous properties were found, including the following types in regard of potential accident:

- gaseous substances stored in pressure bottles, including toxic and combustible substances and those forming explosive mixtures when exposed to air (sulfur dioxide)
- radioactive substances, e.g. uranyl and thorium salts
- highly combustible substances releasing combustible vapors (when reacting with water or between themselves), potentially phyrophobic substances in contact with air or moisture (e.g. sodium and potassium metals)
- explosive substances and substances forming explosive mixtures (pyrotechnical materials)
- volatile substances containing toxic or caustic vapors (fluorhydric acid, hydrochloric acid, nitric acid, hydrous ammonia solution, etc.)
- substances prone to violent mutual reactions (e.g. mixtures of acids and hydroxides, or acids and peroxides, etc.)
- highly toxic and ecotoxic substances, persistent pollutants (e.g. heavy metal compounds)
- high oxidants (hydrogen and sodium peroxide, nitrates, etc.)

3.3.2 Identification of risks

To identify the risks, standard tools and methods, which are applied in similar situations in the chemical industry (eg HAZOP method "Hazard and operability of Study" and other similar methods, such as What-If, FMEA), were used. Especially HAZOP method is a powerful tool even in terms of identifying risk in the detection of illegal hazardous waste. The method was used for its universality and for the rich experience at home as well as in abroad. In addition to that, DEKONTA a.s., company which worked out a study to identify cases of…., also has the experience with this method.

The presence of the above-mentioned groups of hazardous substances helps us to identify substantial risks, the major of which were the following:

- An uncontrolled reaction of mutually incompatible chemical substances accompanied by an explosion of gases or vapors, explosion of flammable liquid vapors, or an explosion of unidentified pyrotechnical contraptions or ammunition threatening employees. Such accidents are dangerous to mainly the personnel in the storage facility and its nearest vicinity. In case of the very pessimistic scenario of the explosion of equivalent 100 kilograms of TNT in a semi-closed space, its effect within less than 200 metres (i.e. the closest buildings) will amounts to a few windows shattered but no direct threats to human lives.
- Breaking transport containers or an uncontrolled reaction of mutually incompatible chemical substances followed by leaks of toxic gases or fumes. The impact of such accident will be smaller than that described in point a) due to the use of small substance packages and reducing the development of toxicant by virtue of the speed of chemical reaction; consequently the danger again ensues mainly for workers in the compound and its close vicinity. There is the danger of contamination of the environment.
- Fire in the depot produces toxic combustion products and threatens site workers and neighboring citizens with environmental contamination. This scenario envisages

maximal risks to the broader neighborhood because the fire has released dangerous chemical substances, especially toxic metal compounds and heat-transformed compounds such as chlorohydrocarbons, pesticides etc., and their transportation by fire smoke and thermal uplift. In this case the area within about one kilometer of the accident will need to feel threatened. The fire itself is very dangerous to employees and IZS personnel due to its toxic effects and the possibility of chemicals exploding in the storehouse. Another major threat is the contamination of the environment by toxic smoke fallout and fire-extinguishing liquids escaping ground levels. It is not possible to rule out the presence of radioactive substances and their possible spread by means of combustion products.

Health risk to site workers due to possible presence of radioactive substances. Due to the heterogeneous nature of hazardous wastes stored in various situations it is necessary to expect the presence of a wide spectrum of miscellaneous dangerous substances in the working environment, with a wide range of dangerous properties (namely: H1 explosiveness; H2 oxidation capacity, H3-A high flammability, H3-B flammability, H4 irritability, H5 harmful to health, H6 toxicity, H7 carcinogeneity, H8 causicity, H9 infectiousness, H10 teratogenicity, H11 mutageneity, H12 ability to release highly toxic and toxic gases in contact with water, air or acids, H13 ability to release hazardous substances to the environment during and after their elimination, and H14 ecotoxicity). PEL is the permitted exposure limit time-weighted as the average concentration of gases, vapors and aerosols in working environment, to which, according to the present level of knowledge, workers could be exposed during an eight-hour working day without being threatened, even after lifelong working exposure, by health problems or reduced working ability and working performance. These limits are applicable to workloads with lung ventilation not exceeding 20 liters per minute. The PEL[1] is accordingly adjusted (decreased) if the workload is higher.

3.3.3 Assessment of safety aspects of the Nalžovice storage site for hazardous wastes and dangerous chemical substances and preparations

DEKONTA a.s., worked out a study concerning this issue Assessment of safety aspects of the Nalžovice storage site for hazardous wastes and dangerous chemical substances and preparations included a description of the site, definition of the source of danger, risk assessment, safety conclusions, and recommended measures to tackle this issue.

Hazardous chemical substances and preparations, found on the site along with stored combustible wastes and materials were singled out as the primary source of danger. They were all the more dangerous because they were stored regardless of the elementary safety principles applicable to work and fire prevention. Only basic information about the substances stored was available, together with a very rough estimate of their quantity at the time of the study. Even though a large part of the substances was preliminarily indentified by labels on bottles and packages, it would have been wrong to assume that the list is complete and the descriptions are reliable, and it was necessary to expect the influx of new information, in terms of both quality

*1 PEL is permissible exposure limit. It is time-weighted average concentrations of gases, vapours or aerosols in the workplace, to which the workers may, according to the present state of knowledge, be exposed during an eight-hour working time, without harming their health, jeopardizing their ability to work and performance, even if they have been in lifetime occupational exposure. The limits apply to the work load, **when the average** pulmonary ventilation does not exceed 20 l / min. If the workload of workers increases, the PEL values are adjusted in respect with that.*

and quantity, about the substances present, as it proved hardly possible to identify all the chemicals piled up.

The list of substances present, as well as the inspection of the site clearly revealed a considerable risk potential due to the toxicity, ecotoxicity, combustibility and oxidation ability of the substances as well as due to their reactivity and mutual incompatibility. When mixed, some of them release highly toxic gases (e.g. combinations of sulfites, thiosulfates, and acids), while others release toxic and corrosive gases upon spilling ((HF, HBr, HNO_3…), and reactions between them could lead to self-ignition (potassium and moisture, potassium and acids), and self-igniting yellow phosphorus was also present. There were many such dangerous combinations at Nalžovice.

Safety risk assessment

The storage facility in Nalžovice harbored a number of potential risks, the most serious of which have been identified in the scenarios quoted below:

a) Rupture of sealed containers (due to damage or spillage), release of toxic or ecotoxic fluids and fumes, intoxication of people and environmental contamination
b) Spontaneous reaction of incompatible chemical substances accompanied by the release of toxic gases or vapors and intoxication of personnel or population
c) Spontaneous reaction of incompatible chemical substances accompanied by explosion of gases or vapors, explosion of flammable liquid vapors, or explosion of undetected pyrotechnics or ammunition involving the risk of injury to personnel
d) Fire in the storage facility followed by environmental contamination

Rupture of sealed containers and release of toxic or ecotoxic liquids and vapors

There were various quantities of substances in the storage facility, which, when spilled, release toxic or caustic fumes, such as fluorhydric, hydrobromic, hydrochloric and nitric acids, hydrous ammonia solution, formaldehyde solution, etc. These substances were present in the order of liters to tens of liters; hence possible accidents would have endangered mainly warehouse workers but also citizens (employees and security personnel of an agricultural enterprise) in the nearest range of tens of meters. Fortunately, all these substances were easy to detect as they produce strong irritable smell, so the probability of exposure to them in the open, which would have led to serious health hazards, was small but not negligible. Hence such scenario of impact on the immediate environment could be rated a medium probability with rather average impacts, although the threat to intervening personnel would have been rather more serious. Therefore careful preparation and tight observance of safety rules were inevitable. A certain risk ensues from the possible escape of environmentally harmful or toxic fluids, inasmuch the storage facilities in question were inadequately protected against leaks, had no emergency tanks or other effective entrapment system, and any substance leak would freely contaminate the environment. The pig farm should have been designed so as to prevent leaks and escape of liquid manure; however, the actual technical condition of the long-disused building was not known to us. The leak and contamination scenario is quite problematic in the event of fire in the storage facility.

Spontaneous reaction followed by the release of toxic gases or vapors

This type of accident was very difficult to predict as wastes in small containers were deposited in packages (such as barrels, boxes or crates, etc.) in a chaotic way, without respecting even the elementary principles of handling dangerous chemical substances and

preparations; sometimes the containers were damaged. The fact that no undesirable chemical reaction or accident happened due to such careless handling procedures ought to be ascribed to sheer luck, rather than to safety-conscious management. The fact that the wastes were deposited in lightweight containers led, similarly as in the case discussed in the previous section, basically to endangering personnel and their immediate environment. The scenario thus described could be considered fairly probable and its consequences would have been similar to the previous case.

Reaction accompanied by explosion; explosion of combustible vapors; other explosions

There existed a certain probability of an explosion in the Nalžovice storage depot. Any explosions, including very small blasts, could and indeed would have triggered fire and the release of hazardous substances multiplying the impact of possible explosions.

- Undetected explosives, ammunition and pyrotechnical materials. Due to the unknown quantity and type of such materials, it is not possible to produce a quantitative estimate concerning this particular event. However, the risk would last until the wastes are sorted out and checked. It should be noted that residues of spent pyrotechnical contraptions were found near the storage depot.
- Reaction of incompatible chemicals directly leading to an explosion. This scenario was very improbable and would not have had major impacts as these combinations are limited and there exist relatively few substances reacting in this way. However, mixing oxidants with flammables would have been a serious problem as such mixes could have caused an explosion triggered by another chemical reaction. It was quite difficult to estimate the possibility of producing explosive organic peroxides by chemical reactions involving organic solvents and atmospheric oxygen, but many explosions have occurred in laboratory and industrial conditions (usually involving evaporation or distillation products), and substances such as unstable diethyl ether, prone to similar reactions and evaporation, were present in the storage depot.
- Mutually incompatible chemicals reacting to produce flammable gases, especially hydrogen. Here the probability was higher, because acids present in large quantities may react with various metals (contained e.g. in scrap metal mixed with waste acids) to produce hydrogen, whose explosive limits are very broad and whose explosions are known to have massive destructive effects. Also present were potassium and sodium boron hydride that release hydrogen when reacting with water. Moreover, hydrogen tends to accumulate in upward-closed “pockets”, for example at ceilings or in upturned vessels, and is easy to initiate.
- Explosive vapors of solvents and other flammable liquids spilled on the floor of storage rooms or leaking from poorly sealed containers. Such explosions can be quite powerful, may disrupt structural statics and are likely to cause massive fires. However, an explosion of this type requires the evaporation of a larger quantity of combustible substances, which may happen only in case of spilling a large quantity of flammable liquids. At the time of completion of this study there was no information available whether the electrical installations on the site were non-explosive or whether sufficient provision was made to prevent the risk of static electricity and other triggers. However, workers faced no small risk of explosion of empty containers with residual flammable liquids, and it was vital to observe strict safety rules.

Fire and its consequences

This scenario envisaged the worst effects but luckily it was the least probable. The above scenarios indicate many possibilities of starting fire also due to negligence, and we certainly

could ill afford to underestimate the risk of the depot being set on fire by a third person, whether through negligence or on purpose, such as in a effort to complicate investigations. A fire in the storage depot would cause massive environmental contamination leading to immediate and chronic threat to the health of the Nalžovice population.

The environment would be contaminated in two principal ways, i.e. noxious fumes and contaminated water used by firefighters. This scenario would lead to the contamination of ground and, in unfavorable circumstances, also of the influent stream (Musík Brook). The situation would probably be further aggravated by the use of firefighting substances that could increase the outflow of rinsed wastes. The mechanics of washing away toxic products of burning chemical storage facilities is well documented by many industrial accidents; the contaminated water used in extinguishing a fire in the Sandoz chemical factory in Basel in 1986 poisoned over 200 kilometers of the river Rhine. However, an even worse effect than earth contamination in the thalweg below the depot would be produced by noxious fumes generated by burning chemical substances including photo chemicals, especially toxic volatile compounds of metals such as arsenic, cadmium, mercury, lead etc. There were kilograms of such metals present in the storage depots; they would evaporate in fire and descend from smoke within a range of probably several hundred meters. Due to the prevailing western winds, the population of Nalžovice could be directly threatened during the fire and subsequently earth and vegetation would be contaminated by the metals, and decontamination would be necessary. The scope of toxic effects would be limited to the nearest environment which, however, hosts an institution for woman clients with limited freedom of movement, which would cause evacuation problems. The toxic effects of smoke from fires are double – acute (sulfur dioxide) and belated (toxic metals).

4. Conclusion

A comprehensive awareness-building program focusing on the environmental impacts of hazardous substances and wastes and on health protection would require considerable investments in the provision of special instruction aids and the training of key target groups to correctly and effectively convey information concerning hazardous wastes. On the other hand, however, it could be assumed that the provision of such information could exercise a much-needed effect from the vantage point of environmental awareness, economics (reducing immediate and prospective sickness rates) and social situation (increasing the quality of life) and become quite effective from the societal point of view. In addition, such comprehensive education could greatly improve the environmental awareness of citizens.

Regrettably, the hazardous waste storage facilities we have discussed are but the tip of the proverbial iceberg of various quantities of variously hazardous wastes and chemicals hidden in defunct industrial buildings, warehouses, residential blocs, etc. Such dumps pose a potential risk of immense proportions to the environment.

The abovementioned cases, together with illegal imports of hazardous waste from abroad and the ecological burden of defunct industrial installations have inspired our analysis and led to the adoption of many measures.

One of the measures that have come to fruition was the compilation of a list of problem sites in 2007. Most regions have each singled out more than three localities; however, the Pardubice, South Moravian and Vysočina regional offices failed to single out localities while some other regions cited completely unsuitable sites.

The Czech Environmental Inspectorate (ČIŽP) has checked 109 localities in a nationwide crash program. No hazardous wastes or chemicals were found in any of these buildings and compounds, which would be delivered there for the purposes of storage.

An analysis of the risk of storing hazardous wastes and chemicals in the former pig farm in Nalžovice showed the site as dangerous to the surrounding area, especially in the event of fire. Although it was possible to reduce the risk posed by this storage depot by taking stock of and sorting out hitherto unsorted wastes, this move alone did not eliminate the risk. That was possible to achieve only by eliminating the source of the danger, i.e. hazardous wastes and chemical substances, and their professional removal. Special attention was paid to the nearby institute of social care and instructing its employees on action in the event of fire and on ways of effective fire prevention, localization and elimination.

Importantly, individual public administration bodies possess sufficient powers to take action to prevent incidents of the type described above.

In order to prevent undesirable situations in connection with the illegal handling of chemical substances and hazardous wastes the Government of the Czech Republic passed Resolution 1076 on 27 August 2008, introducing system-based measures to be implemented by the end of 2009. Chief among them is an amendment to the act on wastes, unification of the methods of granting permission by regional offices to the operators of establishments handling hazardous wastes, and intensifying control activities through the adoption of an online information system monitoring the movement of dangerous substances and wastes, the introduction of a system of handling unused chemicals, and formulating a system of methodological guidance of and assistance to self-governing bodies in the field of waste and chemical waste management.

However, in spite of all the above measures, it is necessary to emphasize the role of prevention, because enforcement is always the last resort. Most of the cases described above can be prevented. One of the necessary conditions for this is the human factor, as evidenced by the list of various mistakes, for which public administration officials were chiefly responsible. No amount of well-coordinated legal regulations alone can guarantee the elimination of such incidents in the future.

Analysis of the abovementioned emergency situations also goes to show that not even the introduction of a specific type-plan for the elimination of such emergencies presents a solution, as incidents tend to differ in their key aspects and every case is quite unique. It is therefore necessary to consistently apply existing IZS policies and to effectively work with public administration bodies with an emphasis on consistent control and vigorous action in the event of detecting a potentially risky case.

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BUSINESS PROCESS MANAGEMENT IN GENETIC APPROACH CONTEXT

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Abstract: *Need of business process management becomes a necessary condition for improving company´s effectiveness. Nowadays, business processes are more complex and contain growing amount of parameters and variables. As a result, business process optimization is getting hardly solvable. Therefore, new approaches are being sought to prove the goal in short time and at low costs. The work shows the possibility of the utilization of business process management, mainly business process planning, with usage of genetic algorithm and genetic programming. The conclusions based on described solutions are then considered due to newly established needs in modern companies.*

Keywords: *Business Process Management, Process Planning, Scheduling, Genetic Algorithm, Genetic Programming.*

1. Introduction

Despite initial failure, there is a rapid development of discipline named business process management (BPM). Historically, there has been a perceived disconnection between organizational structure and processes. Organizations have had to focus on their production efficiency due to raising competitive pressures and globalization. Therefore, new approaches for management, controlling and planning were sought. BPM became a way out of this situation like a customer oriented approach with obvious added value identification. Basic ideas of BPM were introduced by Hammer and Champy [1], who emphasized key factor of information technology which forces companies to pursue improving their business processes.

The organizations look for new procedures of better organization, management, resource planning and controlling in all business processes because of permanent pressure on company efficiency. There are a lot of rapid changing variables in many running processes in today traditional process oriented company. Business process definition interprets process as a collection of related, structured activities or tasks using people and tools to transform set of inputs into collection of outputs for customers or other processes [2].

New methods and procedures are sought in consequence of complexity, quantity and cohesion of business processes. Genetic algorithms and genetic programming are particular class of evolutionary algorithms that use techniques inspired by evolutionary biology such as inheritance, mutation, selection, and crossover. Genetic algorithm and genetic programming are techniques used in computing to find optimal (or close to optimal) solution from entire range of possible solutions (the searched space). The techniques are categorized as global search heuristics [15]. Therefore, genetic algorithms and genetic programming are implemented in many different disciplines.

2. Business processes in genetic approach context – process planning

Process planning or production planning was one of the first revealed areas of BPM where a need of business process optimization occured. Manufacturing company realises desicions

relating to its products before entering the market and for the whole time of its activities. If a company wants to be succesful, it should focus on such a product which can be well sold. Manufacturing of such a product is then business process consisting of exactly described activities that are done in a given order, time and production costs. Company has to know all parametrs and variables entering production process, then company may work up process planning or usage of the tool which enables process planning.

Genetic algorithms and genetic programming benefit from consideration of feasible solution regarding active constraint and variables that are represented e.g. workplace occupancy or resource allocation (human factor, input of products and processing machines). Simply said, chosen solution has to be actually feasible. Such a solution cannot be found in any method planning theory of constraints or MRP systems (MRP calculates with unlimited capability) or other methods which do not consider business processes [3]. Studied business process planning tool has to allow to create updated solution whenever business process variables and parameters are altered. Genetic principle application is able to consider feasible solution set from whole searched space in dynamic terms of business planning processes. Finally, genetic principle is a suitable choice for solving those complex problems [12].

3. Genetic algorithm and genetic programming as business process modelling optimization method

3.1 Optimal Process Product Management

Takeuchi, Yazu and Sakuma [4] introduced process planning method TEMS-AGA (Total Environmental Management System using A Genetic Algorithm) for optimazition process product management. TEMS-AGA takes into account the possible effects on the environment together with other management concerns such as quality, lead-time, and costs. In TEMS-AGA, a problem is modelled by a AND-OR type tree-structure in its structural aspects and by a list of symbolic expressions in its quantitative aspects. TEMS-AGA evaluates the activity (policy, project) using a symbolic manipulation technique. Genetic algorithm is used to search a compromising better solution. Proposed model for optimization inputs satisfies initial conditions and becomes a useful tool for finding efficient solution.

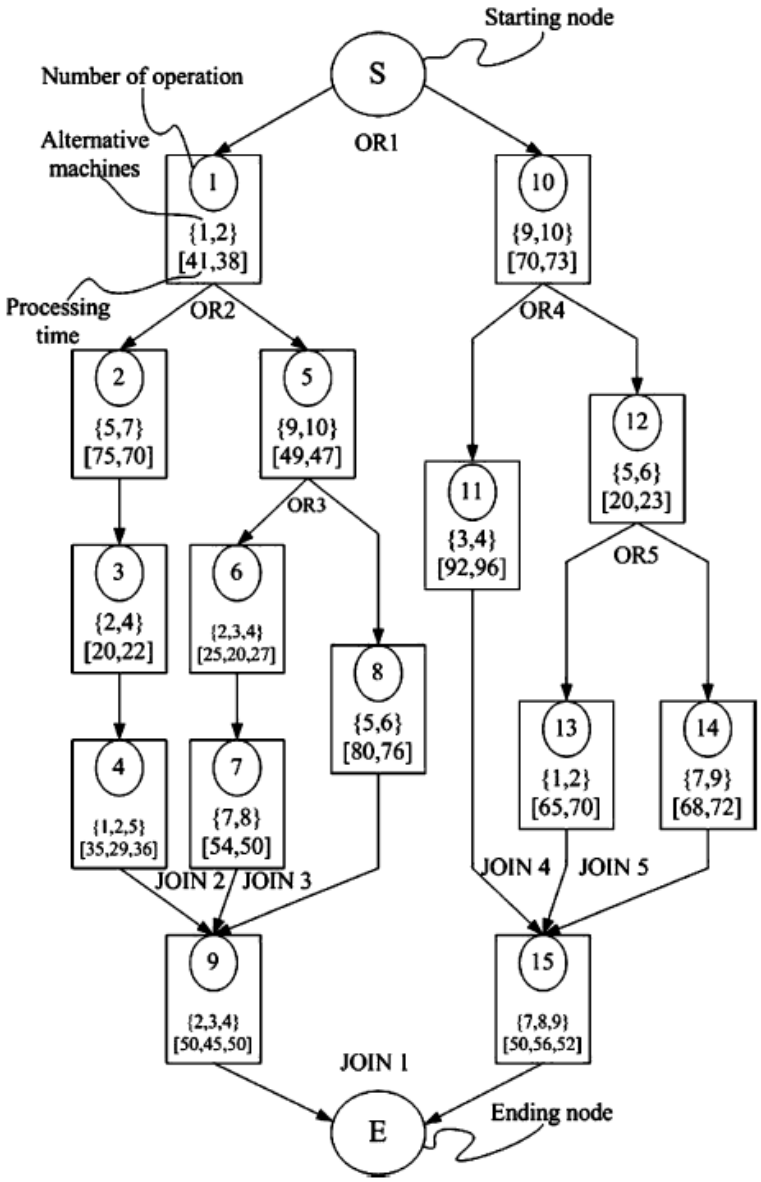
3.2 Flexible Process Planning

In this section, flexible process planning (FPP) is explained in detail. Generally, there are many process plans achieving final product. Hutchinson and Pflughoeft define three classes of process plan flexibility [7]:

- *Sequence flexibility* occurs when an operation can have more than one predecessor or successor.
- *Process flexibility* provides alternative paths for the completion of the plan.
- *Machine tool flexibility* provides a choice of machine tool type to perform the operation rather than dictating a specific machine tool.

Li, Shao and Gao presented all three classes of process plan flexibility in their work [5] featuring technological output where it is necessary to realize three manufacturing features to accomplish the product. In context of three types of flexibility it is possible to execute one operation on alternative machines, with distinct processing time and costs. It is also possible to interchange the sequence of the required operations. Fig. 1 shows flexible process plan represented by network where paths are described by OR-links. There are three types of

network nodes: starting, intermediate and ending. Starting and ending node determines start and finishing of the process. Operations interpreting intermediate nodes are described by alternative machines and time necessary to execute this operation. OR-links between nodes ensure flexibility of process; whatever path from starting to ending node can be implemented. Finally, JOIN node is a node with two or more inputs.



Zdroj: [5]

Fig. 1: Flexible process plan network

Furthermore, mathematic model of FPP is created with following assumptions:

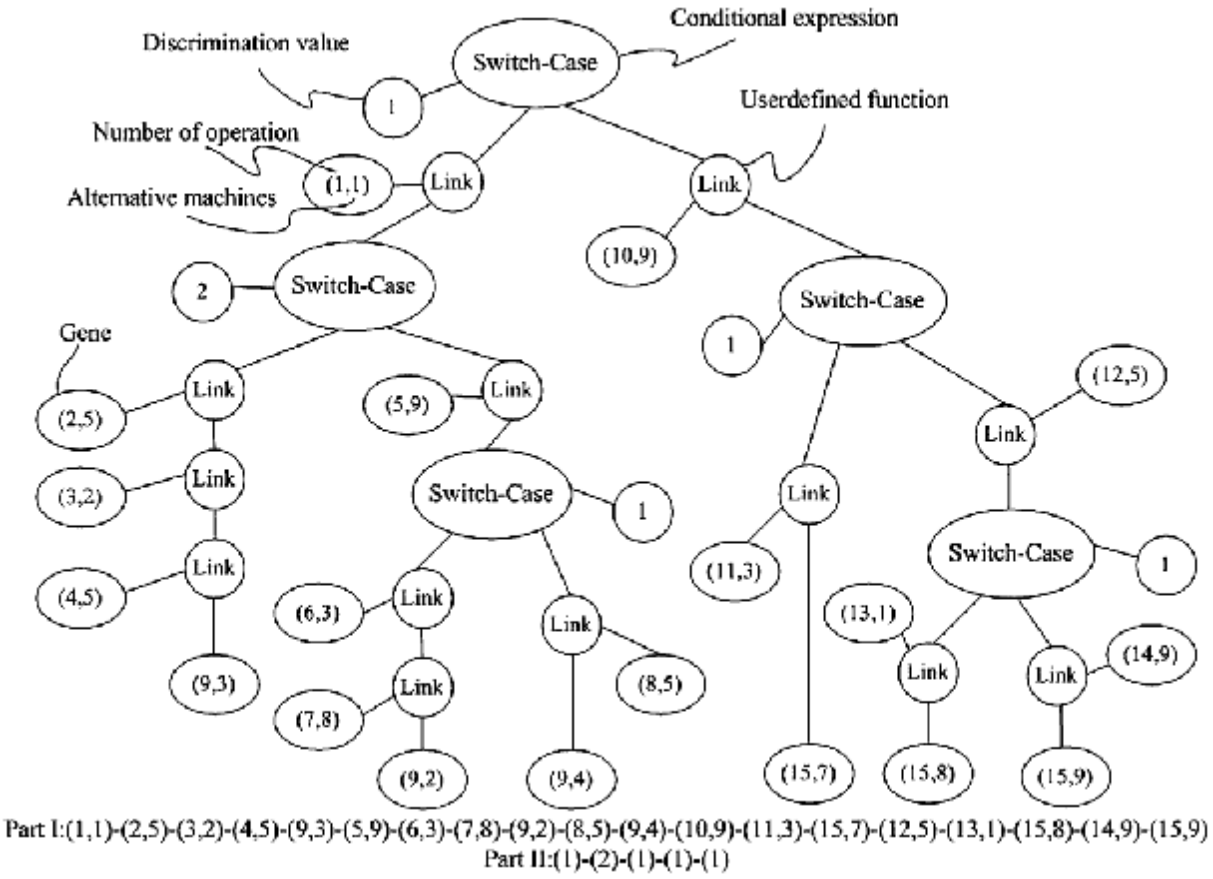
1. Each machine can handle only one job at a time.
2. All machines are available at time zero.
3. After a job is processed on a machine, it is immediately transported to the next machine on its process, and the transmission time among machines is constant.

4. The different operations of one job can not be processed simultaneously.

Genetic programming introduced by Koza [8] was chosen as optimization method in current work. Genetic programming evolves computer programs, traditionally represented in memory as a tree structure. Trees can be easily evaluated in a recursive manner. Each tree node has an operator function and each terminal node has an operand, making mathematical expressions easy to evolve and evaluate.

With knowledge of genetic programming approach, it is inevitable to transform network in Fig. 1 to tree structure. First, the intermediate JOIN nodes are splited into each branch. Because ending nodes are ignored completely, branch is determined by its final executed operation.

As shown in Fig. 2, each tree of each individual is generetad by the function set F={switch-case, link} and terminal set T={discrimination value, gene}. Switch-case is the conditional expression; and link, which connects the nodes together, is user-defined function, and its output is a list. The discrimination value encodes OR-connectors as the decimal integer. It is in concert with the switch-case function to decide which OR-link will be chosen. A gene is a structure and made up of two parts – the first is the operations of job and the other one is alternative machine. The encoding scheme of a tree is a list having two parts: part I is made up of genes, and part II is made up of discrimination values. The sequence of the program is from top to bottom. In the above encoding example, the operation sequence together with the correspodng machine sequence is (1,1)-(5,9)-(6,3)-(7,8)-(9,2).



Zdroj: [5]

Fig. 2: A tree of individual

Genetic programming exploits the same way as genetic algorithms evolutionary operations as crossover, mutation and selection. In the crossover operation, subtree exchange generates feasible descendants, individuals that satisfy precedence restrictions and avoid duplications. Mutation is implemented random chosing gene from the selected individual. Then, the second element of gene is mutated by altering the machine number to another one of alternative machines at random. Consequently, the other mutation is carried out to alter the OR-link path.

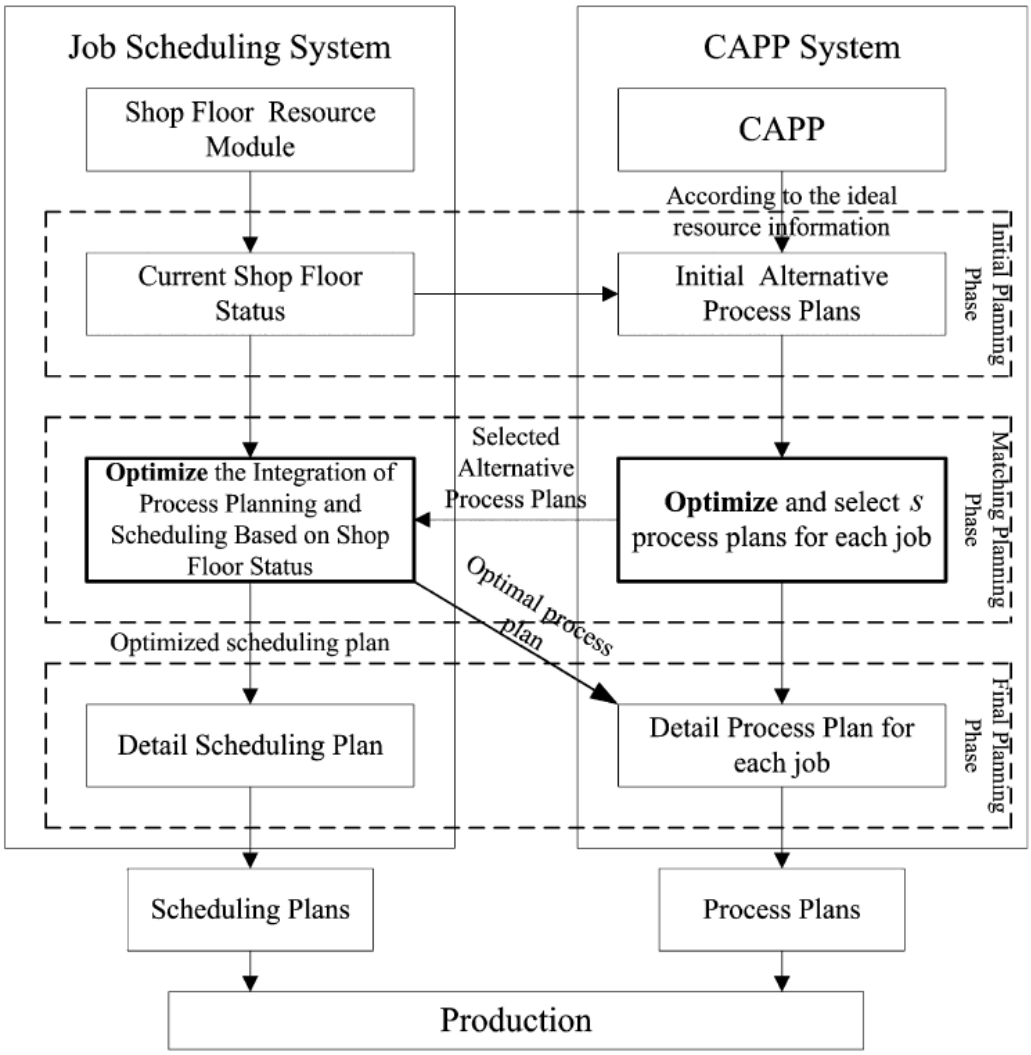
3.3 Integration of process planning and scheduling

Process planning and scheduling are two of the most important sub-systems in manufacturing systems. A process plan specifies which raw materials or components are needed to produce a product and what processes and operations are necessary to transform those raw materials into the final product. Process planning is the bridge of the product design and manufacturing. By contrast, scheduling plans receive process plans as their input and their task is to schedule the operations on the machines while satisfying the precedence relations given in the process plans. It is the link of the two production steps preparing processes and putting them into action [16]. Although there is a strong relationship between process planning and scheduling, the integration of them is still challenge in both research and applications.

Traditionally, process planning and scheduling were carried out sequentially, where scheduling was done separately after the process plan had been generated. This approach has become an obstacle to enhance the productivity and responsiveness of manufacturing systems. Even if, in the planning phase, process planners consider the current resources on the shop floor, the constraints considered in the process planning phase may have already changed greatly because of the time delay between planning phase and execution phase. Investigations have shown that 20-30 % of the total production plans in a given period have to be modified to adapt to the dynamic changing of production environment [9].

In manufacturing companies without the integration of process planning system (IPPS), a true computer integrated manufacturing system (CIMS), which strives to integrate the various phases of manufacturing in a single comprehensive system, may not be effectively realized [10]. In this section, integration model based on the engineering principle where the computer aided process planning (CAPP) [11] and scheduling systems are working simultaneously. The detailed working steps of the integration model are given as follows [6] as shown in Fig. 3:

1. CAPP system is working, based on the ideal shop floor resources. CAPP generates all the initial alternative process plans for each job.
2. Shop floor resource module provides the current shop floor status to the CAPP system. Consequently CAPP system optimizes all alternatives process plans for each job. Because of combinatorial-explosion CAPP ignores poor process plans without affecting the flexibility of the model very much.
3. The integration of process planning (using the selected process plans) and scheduling is optimized, based on the current shop floor status. For each job from the selected process plan is generated the optimal scheduling plan and selected one optimal process plan.
4. CAPP system is used to generate the detailed process plan for each job, and scheduling system is used to generate the detailed scheduling plan.



Zdroj: [6]

Fig. 3: Integration model of process planning and scheduling

As in section 3.2 above , process plans are represented by networks except of splitting and merging nodes which are separated into standalone OR and JOIN nodes as shown in Fig. 4. Premises and mathematical model are similar to work presented in section 3.2, where genetic programming is optimization method. Finally, genetic algorithm is used in integration model of process planning and scheduling.

Genetic algorithm representation of alternative process plans displayed in Fig. 4 is needed. Each chromosome in process planning population consists of two parts with different lenghts as shown in Fig. 5. The first part of chromosome is the process plan string, and is made up of gene. Gene is a structure containing two numbers. The first number is the operation. The second number represents alternative machine. The second part of chromosome defines OR string, and is made up of discrimination values. Discrimination value decides which OR-link is chosen. Fig. 5 shows an example of individual job 1 (see Fig. 4), where first gene is described by operation with number 1 and alternative machine with number 2. Totally chromosome includes 9 genes of part one and two discriminition values of part two.

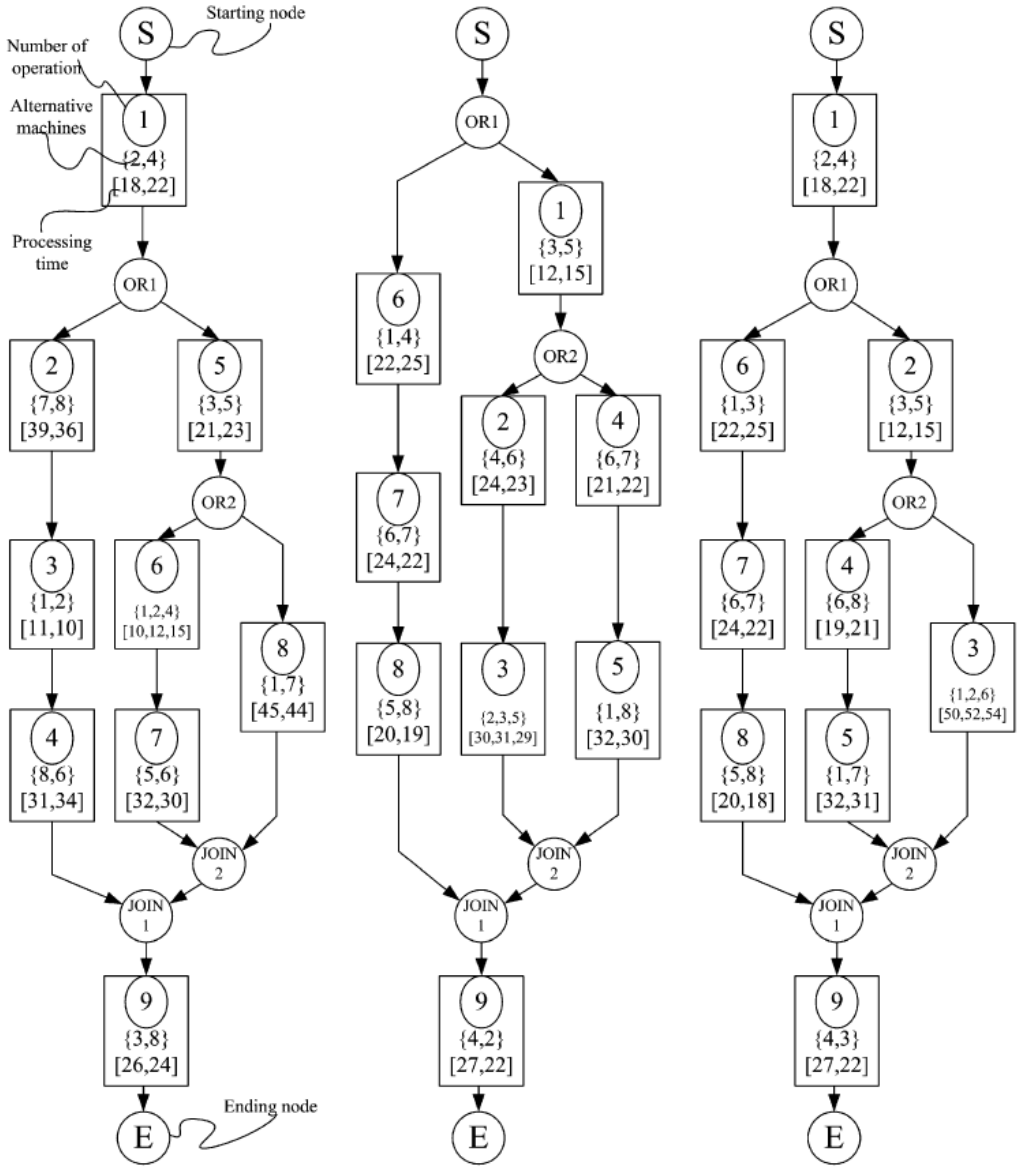


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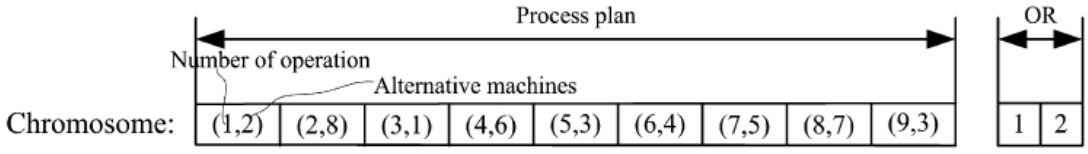
Fig. 4: Alternative process plans networks



Zdroj: [6]

Fig. 5: Chromosome of process plan

Tab. 1 shows encoding of alternative process for manufacturing jobs presented in Fig. 4. By step 2 of integration model, three alternative process plans are chosen for each job. As mentioned above, first number is number of operation and second one is number of alternative machine. Individual of scheduling plan contains two parts as well as individual of process plan. Length of first part (scheduling plan string) is equal to $n*q$, where n is count of jobs and q is count of the most operations among all the alternative process plans of n jobs. Length of

second part (proces plan string) is then equal to *n*. Finally, number of gene in process plan string means ordinal number of alternative process plan.

Table 1: Alternative process plans for 3 jobs

Job	Alternative process plans
1	(1,2)-(5,3)-(8,7)-(9,8)
	(1,2)-(5,3)-(8,7)-(9,3)
	(1,4)-(5,3)-(8,7)-(9,8)
2	(1,3)-(2,6)-(3,2)-(9,2)
	(1,3)-(2,4)-(3,3)-(9,2)
	(1,3)-(4,6)-(5,1)-(9,2)
3	(1,2)-(2,3)-(3,2)-(9,3)
	(1,2)-(2,3)-(4,6)-(5,7)-(9,3)
	(1,2)-(2,3)-(3,1)-(9,3)

As shown in Tab. 1, each job has 3 alternative process plans ($n=3$). Because of maximal count of operations in all process plan is 5 (2nd process plan of 3rd job), then $q=5$. Consequently length of first part (scheduling plan string) of individual is equal to 15 ($n*q$) and length of second part (process plan string) is equal to count of jobs. Genes in second part determinate process plans which will be chosen. In example shown in Fig. 6 will be chosen the first for job 1, second for job 2 and second for job 3. The scheduling plan string is made up according to chosen process plans in process plan string and contains four 1s (because 1st process plan of job 1 has got 4 operations), four 2s (because 2nd process plan of job 2 has got also 4 operations) and five 3s (because 3rd process plan of job 3 has 5 operations). All numbers are arrayed randomly to generate a scheduling plan string. Remaining genes in scheduling plan string are arrayed by value 0.

Base on described representation of solved problem, there is a need of mathematical model definition including fitness function and genetic operators [6]. In case of individual of process plan, crossyover operation is executed by exchanging parts between two process plan strings. Mutation is realised by changing alternative machine numbers or swapping OR nodes. In case of individual of scheduling plan, new offspring is generated by mixture of parent genes. Mutation is then swapping two chosen genes or changing gene in process plan string and following change of scheduling plan string. All operations cannot break defined restrictions and have to allow such solutions which are not in jar with set of created alternative process plans.

4. Conclusion

In this work, process planning and scheduling optimization methods were introduced. Effective tools were made up in all metioned cases. The paper emphasises on characterization of solved problems, process representations and their following encoding suitable for processing and utilization in genetic algorithms and genetic programming. Networks [5], [6], AND/OR graphs [4] or Petri nets [13] are most frequently used types of process reprezentation. Therefore, choosing regular process representation type as well as finding initial statement of a problem, mathematical model determination or right usage of evolutinary methods are necessary presumtion to solve the chosen task [14].

Business process planning and scheduling approaches used in technological manufacturing processes were described in this work. In the future research of a new approach for planning and scheduling processes in companies with character of non-technical proceeding will be created. Most of manufacturing companies do not have strict defined technological procedures due to product is not created by machine manufacturing but human dependent specific

working. Processes performed by people as well as machine manufacturing must have got a determined operational sequences which should be handled in supposed time and intended date. In nowadays manufacturing companies is one of the most frequent problems to finish project in time and costs agreed with customer. Therefore, new process planning and scheduling methods are sought. Suppose that tool for effective real time process planning and scheduling will be developed with using genetic approaches principles.

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USE OF SYSTEMS AND PROCESS APPROACH WHEN MANAGING PROGRAMMES OF LIFELONG EDUCATION

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Abstract: *This paper deals with the use of process modelling for the needs of the process Management of educational programmes of life-long education in the Institute of Lifelong Education at the Mendel University of Agriculture and Forestry in Brno. The process modelling enables to model not only existing but also future processes. In the Institute of Lifelong Education at the Mendel University of Agriculture and Forestry in Brno the method of process modelling has bee used partly when trying to register and encourage new processes occurring in association with the development of this university institution and partly when eliminating some inefficient processes and improving some other. The above process was modelled on the base of an analysis of its structure, internal relationships, events and mutual links and responses. The obtained results enabled to develop a process model, which enables an efficient implementation of the process of Management of educational programmes of life-long education.*

Keywords: *Process Modelling, Education, Projects, Processes, Activities, Events.*

1. Introduction

Historically, the origin of process management has been associated with the production sphere and it stretches back to the era of the establishment of first manufactures. The differences among and between individual historical periods consist, above all, in the fact, that in individual developmental stages, individual attributes of the managerial system itself were more or less stressed and/or that a greater or smaller importance was attributed to them. However, it is substantial that each of these approaches had to control and operate with organisational processes, which represent nothing else than a sum of logically arranged activities, resources, and responsibilities leading to a transformation of inputs into outputs. The main objective of this process is to enable and assure the most efficient transformation and the best possible performance because this is the main purpose of activities of each enterprise and/or organisation.

Process modelling enables to see business activities and processes in their real context and normal situation; from this point of view they can be depicted by means of those methods and approaches that are used for specification and analysis of these processes. Nearly all organised systems may be modelled and its behaviour, requirements and needs may be exactly specified. Modelling, for example, enables to define the mission of an institution on the base a concrete specification of business processes and analysis of their properties. The purpose of modelling is to create such an abstraction of the process, which enables to understand all its activities as well as their interrelations and roles represented by capabilities of people and facilities participating in a given process.

This paper deals with the possibilities of the process modelling use when organising educational programmes of lifelong education at the Institute of Lifelong Education at the Mendel University of Agriculture and Forestry in Brno (ILE MUAF).

2. Material and Methods

The education involves not only acquisition of special skills and teaching and studies on specialised topics but also the dissemination of knowledge, capability of a good assessment and wisdom. One of the basic objectives of education is to pass principles of civilisation from generation to generation.

The main objective of education is to transfer ideas from one person to the other. Problems of the existing educational system involve above all searching of proper methods how to dissemination information, how to teach and what to teach, how to evaluate the importance of disseminated knowledge and also how to preserve the acquired knowledge in the memory of recipients. It is obvious that these and many other problems can be solved an also improved on the base of the systems and process approach.

As all commercial firms, universities also "posses" business processes, which represent a sum of activities transforming the multitude of inputs into a multitude of outputs; these outputs can be used either in other processes or by other people with the support of corresponding human resources and various tools. The improvement of educational processes is (and in the near future surely will be) quite indispensable for the preservation of competitiveness of each university. In the last two decades, it was quite normal in the commercial sphere that firms were forced by their clients to develop and improve their processes because the market required better and better products. In case that the customers do not receive products and/or services they require, they have a possibility to change the supplier and to buy required items from competitors. This is the main feature and strength of modern market economy and a similar situation exists also in the sphere of education. Universities have to develop and manage their internal processes and must systematically and try to develop and improve them. Such approach is based on understanding, measuring and evaluation of existing processes and also on continuous efforts to improve them.

Basic steps of such a continuous improvement of processes are presented in Fig. 1. The first step consists of a description of the current situation, which is followed by a definition of basic quantifiable parameters required by customers. A systematic monitoring of this process then enables to identify opportunities for its improvement; these opportunities must be considered with regard to their mutual relationships, put into a proper context and thereafter implemented. Changes performed within the framework of this process must be properly documented and the whole cycle must be then repeated. This cyclical feedback is also called the system of continuous, systematic improvement of existing processes.

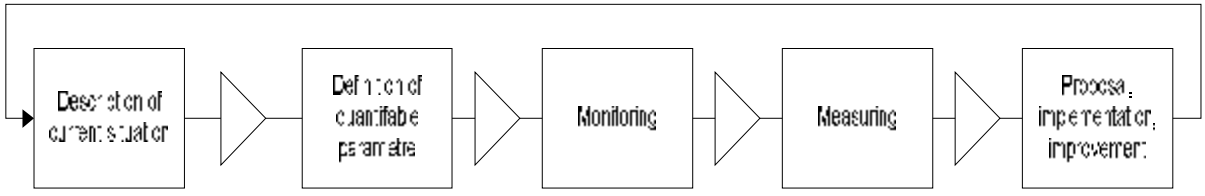


Figure 1: A continuous improvement of existing processes (*Source: Řepa, 2007)*

The aforementioned improvement method of existing processes enables to reach a gradual, stepwise improvement. However, there is also a need of a more radical approach to their change and one of them is the so-called process of reengineering (Business Process Reengineering abbreviated as BPR). This process fundamentally differs from the stepwise method mentioned above. Its basic premise is that the existing processes are fully inadequate, not working or insufficient and that it is necessary to change them radically and from the very beginning (Řepa, 2007). Such a clear view of the problem of process reingeneering also enables us to cut off from the current situation and to concentrate ourselves only to the creation of a fully new process. The reengineering approach is illustrated in Fig. 2. It begins with the definition of the extent and main objectives of the reengineering project, which is followed by a thorough analysis. Results of this analysis enable to create a vision of future processes. Further it is necessary to develop a plan of those activities that will result in a quick introduction of a new system of processes. Implementation stage is the last step of the reingeneering. It will be possible to manage this procedure in an effective manner only if such change is implemented as a project (Máchal & Liška, 2008).

The development of the process model of the ILE MUAF was based on results of an analysis of the process "*Management of educational programmes of lifelong education, its structure, interrelations, and mutual links among individual activit*ies". The model of the managerial process was developed on the base of this analysis. Creation of such a process model and its implementation enable an efficient planning of educational programmes organised by the Department of further professional education of the ILE MUAF without any temporal and/or spatial. Expert activities and consultancy represent an important precondition of the development and creation of process models. Expert activities were defined by Linhartová (2008) as a process which plays a role of a highly qualified expert/consultant both in the fields of study and professional consultancy.

The performed analysis consisted of the following steps:

1. Formulation of necessary activities and their arrangement in the context with the mode of operation, associated documents etc. relating to the implementation of educational programmes of lifelong education in ILE MUAF Brno;
2. Creation of a model of the managerial process *Management of educational programmes of lifelong education*;
3. Formulation of concrete model outputs, e.g. activities plan of the Department of further professional education for a current year, allocation of tuition into individual classrooms, recruitment and acquisition of human resources etc.

The process model was elaborated by means of the software package Enterprise Architect (EA). This package was supported by UML version 2.1 but it was also possible to define additionally also other objects and their characteristics so that there will be practically unlimited possibilities to create further and further models. This is a tool that support and considerably facilitate the whole stage of software development (i.e. from the definition of requirements concerning the system through designing to the preparation of final tests and system documentation. EA package supports Business Process Modelling and this certainly an advantage as compared with other CASE tools, which support only the UML-based modelling. EA package also supports the formation of both logical and physical data models.

In this study, the illustrated process model was visualised by means of the software Microsoft Office Visio. The preformed analysis was supplemented by the method

of description of both process model and the basic parameters. The proposal of implementation of the developed model was formulated on the base of performed process analysis and description.

3. Results and Discussion

Basing on results of the performed analysis those activities of ILE MUAF were formulated at first that were associated with its mission in the domain of lifelong education. The establishment of the university institute at the Mendel University of Agriculture and Forestry in Brno pursuant provisions of § 22 of the Act n° 111/1998 Sb., on universities as well as the Rules of the system of lifelong education at MUAF (an internal regulation of MUAF, issued on 1 September 2008) defined the basic conditions for the implementation of lifelong education at the Mendel University of Agriculture and Forestry in Brno.

As far as the sphere of further professional education is concerned, ILE MUAF is oriented above all on the implementation of a continual development of lifelong education in educational programmes and projects focused on needs of professional public in a close cooperation with teachers and other university employees.

Planning is an indispensable part of any managerial system. This is an activity, which stands at the beginning of the management process. And planning is naturally also the starting point of the project *Management of educational programmes of lifelong education*. This process involves also activities of marketing, logistic, legal and administrative nature.

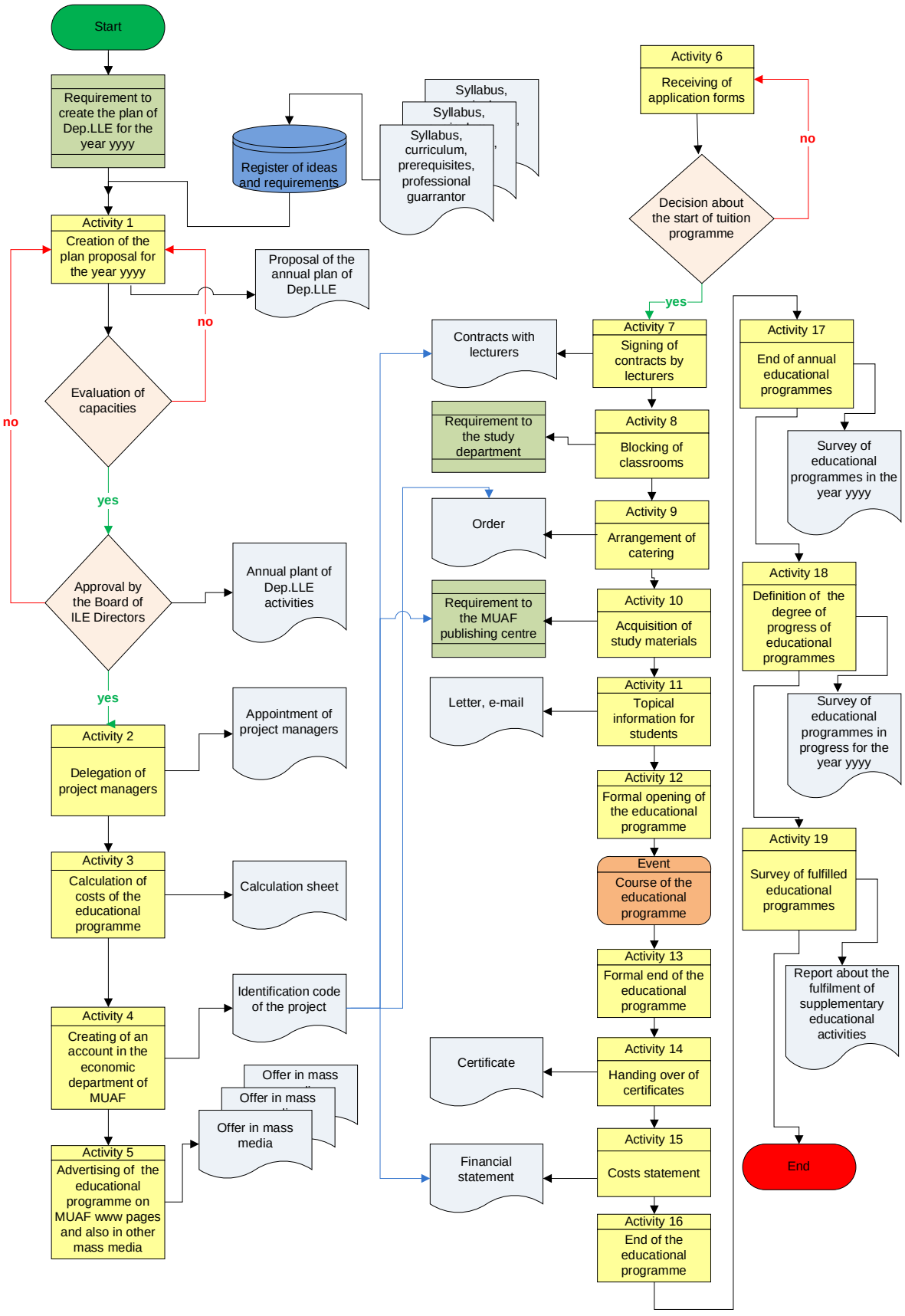


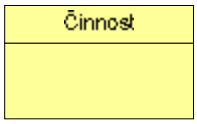
Figure 2: Model of the process *Management of educational programmes of lifelong education* (*Source: author's own data*)

The model *Management of educational programmes of lifelong education* is presented in Fig. 2. When performing its visualisation, the following methodology was used:

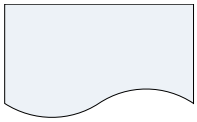
Process beginning

Proces end

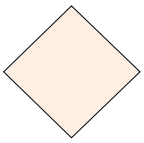
Event triggering the process



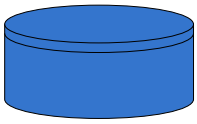
Activity



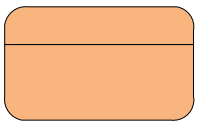
Document



Decision-making



Magazine of prepared educational activities



Event

Dynamic bond of activities

Outlet of decision-making – disapproval of continuation

Outlet of decision-making –approval of continuation

Information bond.

The methodology of the process *Management of educational programmes of lifelong education* modelling is associated with the applied software product, which has been designed for applications in the field of process modelling (in the given case using MS Visio). In general, it is possible to identify the following basic elements of each process model Řepa (4):

- Process;
- Activity;
- Event;
- Dynamic bond.

Processes are always modelled as structures consisting of interlinked activities. However, an activity cannot be described independently as a process. The fact of an activity is or is not described as a process is dependent above all on the method used by the model's author, need of understandability and/or SW package used. The development of a model consists of the following steps:

- Definition of activities;
- Arrangement of activities, i.e. defining and presentation of interrelationships among and between activities (i.e. of logical bonds);
- Estimation of the duration of individual activities, i.e. definition of time necessary for the implementation of individual activities;
- Elaboration of a time schedule, i.e. elaboration of a flowchart depicting individual time intervals, needs and resources.

These activities must be implemented in a logical sequence and must also be interlinked so that it would be possible to develop a block diagram on the one hand and to elaborate a concrete managerial document containing clearly defined terms and responsibilities. When developing process models it is very important to use the systems approach (Lacko, 2002). When applying the systems approach, a successful overcoming of different barriers is a basing precondition of the development of a real process model.

4. Conclusion

This paper deals with possibilities of application of process modelling when implementing the project *Management of educational programmes of lifelong education* at the Mendel University of Agriculture and Forestry in Brno. The method of process modelling enables to plan not only the existing but also future processes. In the ILE MUAF we use the method of process modelling partly in the field of identification of new processes resulting from the development of this university institute and partly when trying to eliminate outdated and inefficient processes with the aim to improve the overall system of work and to increase its competitiveness both in the internal and external competition. The main sources of modelling managerial processes described above were, above all, its analysis, structure, mutual relationships, links and bonds on the base of an analysis of events and responses. Results of the performed analysis were used when developing the process model enabling to master efficiently the process *Management of educational programmes of lifelong education*.

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IMPLEMENTING VARIOUS METHODOLOGICAL APPROACHES TO RESEARCH OF QUALITY OF LIFE AS POSSIBLE SUPPORT METHODS OF PUBLIC ADMINISTRATION DECISION MAKING

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Abstract: *Public administration should use a wide spectrum of supportive materials for decision making. This paper tries to outline the possibilities of utilizing methods of Artificial Intelligence (decision trees) at this process, especially at interpretation of the data gained in a public opinion survey and at other types of questionnaire surveys. Satisfaction of citizens (high quality of their lives) should be the result of all the decision making processes.*

Key words: *Public Administration, Empiric Social Survey, Quality of Life, Modeling.*

1. Introduction

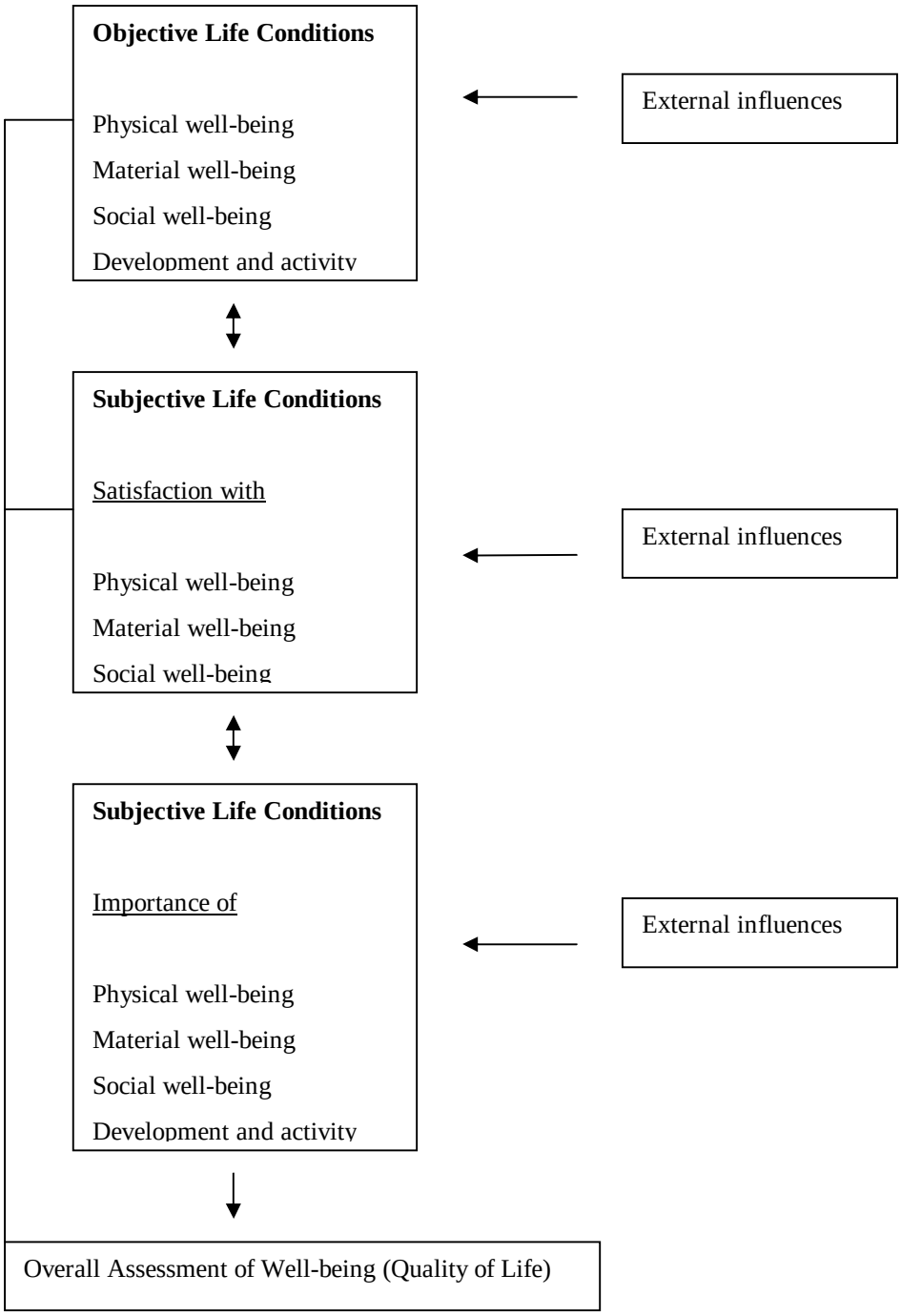
Should we consider quality of life as a unit of measurement of a correct public administration functioning, we have to specify a generally acceptable definition of this problem at first. This brings a lot of questions, for we have to work not only with terms on philosophical, psychological, sociological, economical and health base, but also on a historical base when defining the quality of life.

All the decision making processes which are made by public politics should lean back to relevant entry data. It should never happen that the public administration representatives would follow just their intuition. Hence the aim of this contribution is to describe some of the approaches to establishing the quality of life. On the base of these approaches is, with a practical example of an analysis of needs of aurally disabled persons (the analysis was realized by the University of Pardubice on a demand of Regional authority Pardubice), shown, how to approach to recognition of the quality of life of this specific focus group of social policy.

2. Dilemmas of the term “quality of life“

The quality of life contains data about psycho-social state of individual, influenced by many factors, such as age, sex, education, social status, economical situation, values or well-being of the individual. The quality of life has to be judged as an appraisal of one’s life situation (Philips, D.; 2006). This concept might be found also in other theoretical conceptions. Balegová, O. (2002) distinguishes three epistemological and experimental streams that are used at inquiring and interpretation of this term: social, economical and well-being indicators.

The complex character of this term also is also shown in the following scheme of a quality-of-life model.



Pict. 1: Model of quality of life (Rapley, M.:2003. p. 54)

According to the World Health Organization (WHO) we can speak about four basic dimensions of human life that determines the quality of life. These are fully independent on factors as age, sex, ethnic or disablement (Műhlpachr, P; 2005; s .61):

- physical health and a level of independence – energy and tiredness, pain, relaxation, mobility, everyday life, dependency of medical care, ability to work etc.

- psychical health and mental aspects – self-concept, negative and positive feelings, self-evaluation, thinking, learning, memory, concentration, belief, spiritualism, confession etc.
- social relations – personal relationships, social support, sexual activity etc.
- environment – financial resources, freedom, safeness, accessibility of medical and social care, home atmosphere, opportunities for gaining new knowledge and abilities, physical environment (pollution, noise, traffic, climate) and so on.

Quality of life is influenced by many variables such as psychosomatic state of individual, social relations, culture, value system, one's relation to his aims, expectations, norms and fears, confession and also relation to his key spheres of his living environment. This means that quality of life comprehends in itself the way how a person perceives his own individual place in life (Vaďurová, H., Mühlpachr, P.; 2005).

3. Dilemmas at obtaining statistic data about quality of life

In our conditions the quality of life is generally examined by two statistical approaches: inquiring frequency of incidence and index of satisfaction – scale. Data, which are further discussed, are gained within a research of public opinion in the first case and in the second case within questionnaire survey concerning ECI (European Common Indicators). The object of our interest is the indicator A1 – satisfaction of citizens with local community. It is not the aim of this contribution to discuss the approach of every single institution that investigates the quality of life, however, it tries to point out the problems connected with inquiring quality of life with regards to the fact that it does not cover all the accessible methods and approaches in this area. Most often it is the Institute of Sociology of the Academy of Sciences that inquires the public opinions (here we speak about inquiring the incidence of frequency – concretely the results are presented as a relative frequency). The ECI indicators are used by all sorts of citizen initiatives working on sustainable development of regions, municipalities etc.

Both approaches realize the inquiry of interviewees' individual attitudes. In both cases the instrument of data acquisition is a questionnaire. The Institute of Sociology of the Academy of Sciences (AV CR) usually focuses, beside the question of life satisfaction or satisfaction with the place where the respondent lives, on the whole spectrum of questions from political, social or ecological field. The inquiry concerns a representative sample of population and is repeated regularly (which is important to increase the candor of the data as well as its interpretation). A standardized questionnaire exists for indicator A1, which is used in terms of local initiatives and is focused on noticing even a petty aspect of satisfaction within respondents. A questionnaire, thanks also to the attitude scale, reflects better opinions and attitudes of respondents. The questionnaire surveys focused on the indicator A1 are not, however, conducted in the particular localization repetitively, therefore it is not possible to verify, whether the respondents have reflected their long-lasting attitudes or whether they have acted just under the influence of a moment. Another weak point of the initiatives inquiring the A1 indicator is the dissimilarity of the final reports and insufficiency in methodology description (incomplete description, the way of reaching representatively of the experimental sample, how the research was conducted and so on).

Exploitation of the ECI indicators is advantageous as it takes specifics of the particular region in account and due to this fact it is a more suitable method for gaining input data (on which depends deciding of public politics) then a public opinion survey realized by the Institute of Sociology (Academy of Sciences CR). On the other hand, the method used by the Institute

of Sociology (Academy of Sciences CR) has an undeniable advantage for the validity and reliability of the gained data is high.

A questionnaire survey that would be conducted repeatedly appears as a suitable method of gaining data related to quality of life. It would embrace questions concerning not only frequency of incidence, but also index of satisfaction and will be carried out on a regional level, having in mind all the methodological appendages of a sociological survey. The content of a questionnaire should unwind from which dimensions of quality of life needs the submitter (regional management) to involve.

One of inspiring themes might be the WHOQOL 100 questionnaire. This questionnaire should be, in frames of usefulness for deciding process of public administration, modified, so that it would be apparent from the answers of the respondents what is the concrete cause of their satisfaction or dissatisfaction with their quality of life.

Authors of the WHOQOL questionnaire go out from the definition of quality of life which says that quality of life is the way how a person perceives his own position in life (in cultural context, in relation to his/her aims, expectations, interests). WHOQOL 100 contains 24 aspects that are compounded into six domains, such as physical health, living through, level of independence, social relations, environment, spiritualism and total quality of life. The questionnaire is designed for people under 65. For elderly people a modification called WHOQOL OLD is used. WHOQOL distinguishes among components of people with different level of health difficulties and it also distinguishes between men and women. Retested reliability of the domains of questionnaire WHOQOL-100 measured in intervals of two weeks shows the relative stability of statements in this interval. Usage of questionnaire WHOQOL-BREF could be an alternative. This questionnaire is compounded from 24 items categorized into four domains and two spare items evaluating the total quality of life and state of health (altogether 26 items). It is not eligible to use the questionnaire to underpin the influence of momentary state of mind or short-time changes. (Miovská, L.; 2009).

4. Dilemmas of establishing the quality of life of aurally disabled persons in the Pardubice region

At the beginning of creating a methodology of inquiring quality it is necessary to perceive that (any) hearing handicap means that a person will be affected by many serious communicational barriers. These barriers will affect all areas of their life and they will influent them considerably. People with hearing handicap have the same communicational need as all other people. However, much more often they interfere with misunderstandings or reluctance of other people to accommodate communication canals to the needs of the handicapped. In contrast to ocular or other health handicap, the auditory disability is not so visible.

Hearing disablement comprises a heterogeneous group, in which the level and kind of the hearing disablement varies. Horáková, R. (2006) defines three basic categories of persons: deaf, hard of hearing and deaf turned.

Aurally disabled people use mostly following forms of communication: oral methods, sign language (this includes Czech sign language and signed Czech) and lip-reading technique (however, lip-reading is not a substitution of hearing). According to Leonhardt (2001), hearing disability is one of the most wide-spread somatic-functional disability among the population.

One of the few accessible resources of information about people with hearing disabilities in Pardubice region is the final report of the survey of needs of hearing disabled living in the

territory of Pardubice region. This survey was executed by the University of Pardubice in 2009.

Population of aurally disabled is one of the least described target groups of regional social policy. Neither exact estimation of their number nor a list of organizations working with them exists. The executed survey of needs indicates that in the Pardubice region live approx. between 50 and 60 thousand persons with hearing disability. Other qualified estimation submits, that around 200 – 600 deaf people live there. Resulting from the analysis it is necessary to work with two groups of people with hearing disability:

- elderly people of senior age, that are often hard of hearing
- persons with other serious hearing disability without age specification (Mandys, J.; 2009)

This would mean that if we intend to study the quality of life of people with hearing disability, we would study the quality of life mainly among the deaf and deaf-turned people (of all ages) and the quality of life of hard-hearing senior people. In this case it would involve two groups of people. These groups differ in everyday-life problems and also in their experience. Eventual survey and formation of social policy have to take this fact into account.

For the inquiry was used a questionnaire survey that dealt with these basic areas of inquiring:

- identification of respondents (of the target group for improving present social policy): type of hearing disability, technique of communication, sex, education, age, employment, number of children and their health state
- identification of everyday-life problems: communication with administrative departments, accessibility of information, access to medical aid, occupation
- other areas: suitability of educational system, usage of interpreter, interest in interpreter services, usage of social service

The final report indicates that the respondents have understanding problems mainly at communication with administrative departments and public service. However, they have problems also in other situations like shopping and making claims, seeking a job, communication with police, neighbors and neighborhood. Respondents point out that the majority of communication barriers are not caused by their handicap. They are often able to compensate the handicap with other abilities. The barriers are caused mainly by reluctance to understand shown by the other communication partner. The reluctance is mainly given by impatience of both communication partners (Mandys, J.; 2009).

On the base of this result we can assume, that quality of life of people with hearing problems is significantly different from the quality of life of majority population – even without impeaching the attribute of hearing disability.

Statistic elaboration of an analysis (occurrence of absolute and relative frequency, as it is presented in the results of the analysis) makes it impossible to use the modeling method via decision trees (about this method is spoken below) and any appointing of quality of life would be purely on hypothetic base. Anyway, the analysis enables, due to four reasons, creating a base for further real inquiring of quality of life of people with aural handicap in the Pardubice region. The reasons are:

- the analysis defines key areas to which the quality of life is related

- gained experience with communication with target group make any further survey easier and rises validity of gained data
- it is necessary to work with two groups of aurally disabled
- had the questionnaires been repeatedly reevaluated so that the data might have been used in the models of decision trees, it would be possible to create an illustrative model indicating on which aspect we should concern in the survey self.

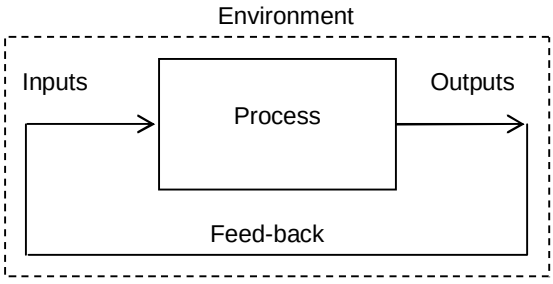
5. Usage of the decision tree method

Aside the classic statistic elaboration, it is possible to elaborate the gained data in the survey of quality of life via the methods of IT and AI. Decision trees represent one of such a method. Decision trees enable to create models of inputs and outputs that can be factually used in public administration's decision making processes and not only on a local level.

Decision tree might be defined as a tree (tree graph), where every non-foliate node represents a test of attribute's value and the branches leading from this node represent the results of the test. Intuitive visual depiction by the tree facilitates better understanding of the results and relations. Tree graphs enable to visually inquire the results and consider the pertinence of a model. Decision trees might be diverted to decision rules. Every path through the tree from the roots to the leaves responds one rule. Non-foliate nodes are conditions; foliate node is the conclusion of the rule. Modeling is widely-spread work cognitive method which is asserted in many areas of social praxis (Křupka, J., Kašparová, M., Jirava, P.; 2009).

Decision tree is undirected, coherent, acyclic, prismatic and node-evaluated graph. Sequence of nodes and paths of graphs is expressed by resolved decision process. Paths represent variants that are the object of the choice of a decision maker. Decision nodes depict that phase of decision making process, when the decision maker has the possibility to make a choice of a variant from a file of designed variants. Decision trees enable not only depiction of consequences of high-risk variants in regard of the chosen evaluation criterion, but also in regard of determination of optimal decision strategy in multi-phase decision processes (Vosejpková, M.; p. 1 - 2).

If we accept the validity of system theory and if we suppose that leading is a dynamic system, then we can use cybernetic principles of leading shown in the picture nr.2. In a process are two components (control component, which is represented by regional management and controlled component, which may be understood as a region) and relationship between these components, which represents a control intervention. Inputs are planned demands to control component and external action at controlled component. Change in quality of life is the output. In the feedback is located a model of satisfaction evaluation as a subsystem of the control system.



Pic. 2: Model of system control according to Norbert Wiesner (Křupka J., Kašparová, M., Jirava, P.: 2009. p. 2)

6. Conclusion

There exist many methodological approaches to measurement of quality of life. The question is, whether the findings should be given to politic representation just in the form of some announcement (rehearsal) or if it is possible to transfer the results of surveys by modern informatics methods to clear decision models. Modern information technologies in combination with classic empiric (sociologic/social) survey may be rational basis for creating public policies.

Despite the multidimensional character of the term "quality of life"we can gain relevant data about this subjective value. Essential condition is to know what exactly we have to inquire (areas like culture, sport, economical situation of household, health, satisfaction etc.) and to use the methods in compliance with principles of scientific knowledge (especially exact description of data gaining, entireness of final survey reports).

In spite of the fact, that modeling techniques can shift the interpretation of statistic data into new level, it is necessary to have in mind that as well as social models, also the final decision models are only a base material which helps the regional management in orientation in situation solving and we cannot judge them as invincible dogmas. It is necessary to consider the specifics of every region and individual needs of the target group on which the policy is aimed.

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AIR POLLUTION ASSESSMENT USING INTUITIONISTIC HIERARCHICAL FUZZY INFERENCE SYSTEMS

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Abstract: *The paper presents the basic notions of intuitionistic fuzzy sets and intuitionistic fuzzy inference systems. Further, there is a design of intuitionistic hierarchical fuzzy inference system of Mamdani type for air pollution assessment. The proposed approach is based on the fact that air pollution assessment is rather subjective. Therefore, a generalization of fuzzy logic seems to be suitable for air pollution assessment.*

Keywords: *Air Pollution, Air Quality, Intuitionistic Fuzzy Logic, Intuitionistic Fuzzy Inference System.*

1. Introduction

Current approaches to air pollution assessment consider relevant air pollutants (e.g. CO, NO_2, O_3, PM_{10} and SO_2) frequently monitored at long-term stations within air pollution monitoring networks. However, due to inconsistency and distinction of each air pollutant, there is a vagueness or fuzziness in air quality. Fuzziness makes the use of sharp boundaries in classification schemes hard to justify. Moreover, different breakpoint concentration values and air quality standards are reported in the literature [12,28]. Further, it would be significant to consider local conditions when defining breakpoint concentrations. As a matter of fact, different areas of the world are characterised by different climatic conditions influencing the effect of atmospheric pollutants on human health and also the response of population to air pollution could be different. This fuzziness led some environmental researchers to look for advanced assessment methods based on fuzzy logic [13,21,22,23], such as fuzzy synthetic evaluation [24]. Another issue is coupled to the fact that there are several pollutants presented simultaneously in the atmosphere. Therefore, the effects on human health due to the simultaneous presence of different pollutants in the atmosphere should be considered.

Based on presented facts it is obvious that a generalization of fuzzy logic [15] would be suitable for air pollution assessment. At this time there are several generalizations of fuzzy set theory for various objectives. Intuitionistic fuzzy sets (IFSs) theory [5,6,7,8,9,27] represents one of the generalizations, the notion introduced by K. T. Atanassov [2,3]. Intuitionistic fuzzy sets theory has been applied in different areas, for example logic programming [4], multiattribute decision-making processes [18], reasoning [19], optimization in an intuitionistic fuzzy environment [1], medical diagnosis [10], etc. Another possibility of its application is the modelling of economic, social and environmental processes. The IFSs are for example also suitable for the air quality modelling as they provide a good description of object attributes by means of membership functions and non-membership functions. They also present a strong possibility to express uncertainty.

The paper presents the basic notions of IFSs, intuitionistic fuzzy inference systems (IFISs) and a design of intuitionistic hierarchical fuzzy inference systems (IHFISs) of Mamdani type. Hereby, it points out the reduction of IF – THEN rules. Based on [20], the output of IFIS is defined in general. In the next part of the paper, we design and formalize of the tree IHFIS of

Mamdani type. The classification of the i-th district $o_i^t \in O$, $O=\{o_1^t, o_2^t, \ldots, o_i^t, \ldots, o_n^t\}$ in time t to the j-th class $\omega_{i,j}^t \in \Omega$, $\Omega=\{\omega_{1,j}^t, \omega_{2,j}^t, \ldots, \omega_{i,j}^t, \ldots, \omega_{n,j}^t\}$ realized by IHFIS assists state administration to evaluate air quality. The knowledge of notable experts in the field of air quality measuring gives support to the results of the classification.

2. Problem Formulation

A well-known air pollution assessment approach is the air quality index (AQI) developed by Environmental Protection Agency (EPA) [11]. It is defined with respect to the five main common pollutants, i.e. CO, NO_2, O_3, PM_{10} and SO_2. An aggregate AQI based on the combined effects of five criteria pollutants (CO, SO_2, NO_2, O_3 and PM_{10}) taking into account the European standards was developed by [17]. The AQI uses both the direct numerical expression and the linguistic description. The values of air pollutants are transformed into a dimensionless number characterizing the state of air pollution. Based on the value of the AQI the state of air pollution can be classified into six classes. A sample of classes $\omega_{i,j}^t \in \Omega$ for the AQI of the Czech National Institute of Public Health (CNIPH) is presented in Table 1.

Table 1 AQI classes $\omega_{i,j}^t \in \Omega$ of the CNIPH

AQI	$\omega_{i,j}^t$	Class description
⟨0,1)	$\omega_{i,1}^t$	Clean air, very healthy environment.
⟨1,2)	$\omega_{i,2}^t$	Satisfactory air, healthy environment.
⟨2,3)	$\omega_{i,3}^t$	Slightly polluted air, acceptable environment.
⟨3,4)	$\omega_{i,4}^t$	Polluted air, environment dangerous for sensitive population.
⟨4,5)	$\omega_{i,5}^t$	High polluted air, environment dangerous for the whole population.
⟨5,6)	$\omega_{i,6}^t$	Very high polluted air, harmful environment.

Another AQI used in the Czech Republic was developed by the Czech Hydro meteorological Institute. The AQI is based on the results of weight concentrations measures of substances in the air (Table 2). The evaluation takes the possible influence of human health into account [26].

Table 2 AQI of the Czech Hydrometeorological Institute

Air quality	SO_2	NO_2	CO	O_3	PM_{10}
	1h [$\mu g.m^{-3}$]		8h [$\mu g.m^{-3}$]	1h [$\mu g.m^{-3}$]	
Very good	0-25	0-25	$0\text{-}1.10^3$	0-33	0-15
Good	25-50	25-50	$1.10^3\text{-}2.10^3$	33-65	15-30
Favourable	50-120	50-100	$2.10^3\text{-}4.10^3$	65-120	30-50
Satisfactory	120-250	100-200	$4.10^3\text{-}1.10^4$	120-180	50-70
Bad	250-500	200-400	$1.10^4\text{-}3.10^4$	180-240	70-150
Very bad	>500	>400	$>3.10^4$	>240	>150

Except the air pollutants, there are also other components influencing the overall air pollution. For example, solar radiation, the speed or the direction of wind, air humidity and air pressure represent these components. The interaction of both types of parameters (air pollutants and meteorological parameters) can cause an increase of air pollution and influence the human health this way. The design of the parameters, based on previous correlation analysis and recommendations of notable experts, can be realized as presented in Table 3.

Parameters	
Air pollutants	$x_1^t = SO_2$, SO_2 is sulphur dioxide.
	$x_2^t = O_3$, O_3 is ozone.
	$x_3^t = NO$, NO_2 (NO_x) are nitrogen oxides.
	$x_4^t = CO$, CO is carbon monoxide.
	$x_5^t = PM_{10}$, PM_{10} is particulate matter (dust).
Meteorological	$x_6^t = SW$, SW is the speed of wind.
	$x_7^t = DW$, DW is the direction of wind.
	$x_8^t = T_3$, T_3 is the temperature 3 meters above the Earth's surface.
	$x_9^t = RH$, RH is relative air humidity.
	$x_{10}^t = AP$, AP is air pressure.
	$x_{11}^t = SR$ is solar radiation.

Table 3 Parameters design for air pollution assessment

Based on the presented facts, the problem of air pollution assessment represents a classification of objects (districts) $o_i^t \in O$, $O=\{ o_1^t, o_2^t, \dots, o_i^t, \dots, o_n^t \}$ in time t into the j-th class $\omega_{i,j}^t \in \Omega$. The monthly values of parameters $\mathbf{x}^t=(x_1^t, x_2^t, \dots, x_k^t, \dots, x_m^t)$, m=11 for $o_i^t \in O$, $O=\{ o_1^t, o_2^t, \dots, o_i^t, \dots, o_n^t \}$, districts in the city of Pardubice, Czech Republic, (Fig. 1) represent the data set.

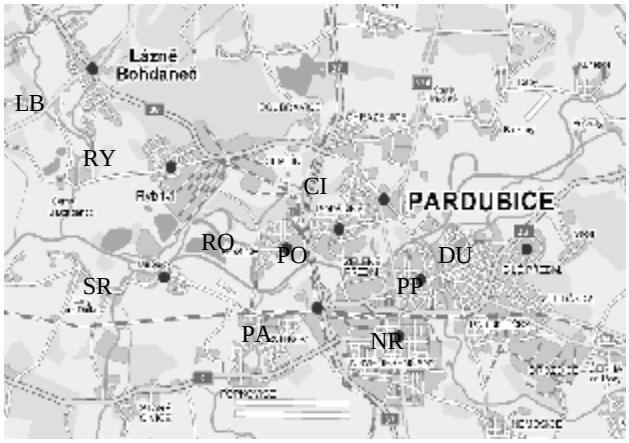


Fig. 1 The map of the districts (black points)

Legend: Bus stops: (Cihelna (CI), Dubina (DU), Polabiny (PO), Rosice (RO), Rybitví (RY), Srnojedy (SR)), crossroads: (Palacha-Pichlova (PP), Náměstí Republiky (NR)), Lázně Bohdaneč (LB), chemical factory of Paramo (PA).

3. Basic Notions of Intuitionistic Fuzzy Sets

The concept of intuitionistic fuzzy sets is the generalization of the concept of fuzzy sets, the notion introduced by L. A. Zadeh [29]. The theory of intuitionistic fuzzy sets is well suited to deal with vagueness. Recently, the intuitionistic fuzzy sets have been used to intuitionistic classification models which can accommodate imprecise information.

Let a set X be a non-empty fixed set. An intuitionistic fuzzy set A in X is an object having the form [2,3]

$$A = \{ \langle x, \mu_A(x), \nu_A(x) \rangle \mid x \in X\}, \quad (1)$$

where the function $\mu_A: X \rightarrow [0,1]$ defines the degree of membership function and the function $\nu_A: X \rightarrow [0,1]$ defines the degree of non-membership function, respectively, of the element $x \in X$ to the set A, which is a subset of X, and $A \subset X$, respectively; moreover for every $x \in X$, $0 \leq \mu_A(x) + \nu_A(x) \leq 1$, $\forall x \in X$ must hold. The amount

$$\pi_A(x) = 1 - (\mu_A(x) + \nu_A(x)) \quad (2)$$

is called the hesitation part, which may cater to either membership value or non-membership value, or both. For each intuitionistic fuzzy set in X, we will call $\pi_A(x) = 1 - (\mu_A(x) + \nu_A(x))$ as the intuitionistic index of the element x in set A. It is a hesitancy degree of x to A. It is obvious that $0 \leq \pi_A(x) \leq 1$ for each $x \in X$. The value denotes a measure of non-determinancy. The intuitionistic indices $\pi_A(x)$ are such that the larger $\pi_A(x)$ the higher a hesitation margin of the decision maker. Intuitionistic indices allow us to calculate the best final results (and the worst one) we can expect in a process leading to a final optimal decision. Next we define an accuracy function H to evaluate the degree of accuracy of IF-set by the form $H(A) = \mu_A(x) + \nu_A(x)$, where $H(A) \in [0,1]$. From the definition H, it can be also expressed as follows $H(A) = \mu_A(x) + \nu_A(x) = 1 - \pi_A(x)$. The larger value of H(A), the more the degree of accuracy of the IF-set A.

If A and B are two intuitionistic fuzzy sets of the set X, then [2,3]

$A \cap B = \{\langle x, \min(\mu_A(x), \mu_B(x)), \max(\nu_A(x), \nu_B(x))\rangle \mid x \in X\}$, (3)

$A \cup B = \{\langle x, \max(\mu_A(x), \mu_B(x)), \min(\nu_A(x), \nu_B(x))\rangle \mid x \in X\}$, (4)

$A \subset B$ iff $\forall x \in X$, $(\mu_A(x) \leq \mu_B(x))$ and $(\nu_A(x) \geq \nu_B(x))$, (5)

$A \supset B$ iff if $B \subset A$, (6)

$A = B$ iff $\forall x \in X$, $(\mu_A(x) = \mu_B(x)$ and $\nu_A(x) = \nu_B(x))$, (7)

$\overline{A} = \{\langle x, \nu_A(x), \mu_A(x)\rangle \mid x \in X\}$. (8)

4. Intuitionistic Hierarchical Fuzzy Inference Systems Design

Let there exists a general IFIS defined in [20]. Then it is possible to define its output y_η as

$$y_\eta = (1 - \pi_A(x)) \times y_\mu + \pi_A(x) \times y_\nu, \quad (9)$$

where y_μ is the output of the FIS using the membership function $\mu_A(x)$, and y_ν is the output of the FIS using the non-membership function $\nu_A(x)$.

Let $x_1, x_2, \ldots, x_m$ be input variables, and let $y_\eta^{1,1}, y_\eta^{2,1}, \ldots, y_\eta^{q,1}$ be the outputs of subsystems $FIS_\eta^{1,1}, FIS_\eta^{1,2}, \ldots, FIS_\eta^{q,1}$, where $\eta=\mu$ are membership functions ($\eta=\nu$ are non-membership functions). Then, IF – THEN rules $R^{h_{1,1}}, R^{h_{2,1}}, \ldots, R^{h_{q,1}}$ of the tree IHFIS, presented in Fig. 2, where q is the number of layers, can be defined as follows:

Layer 1: $FIS_\eta^{1,1}$ $R^{h_{1,1}}$: IF x_1 is $A_1^{h_{1,1}}$ AND x_2 is $A_2^{h_{1,1}}$ THEN $y_\eta^{1,1}$ is $B^{h_{1,1}}, \ldots$ (10)

Layer 2: $FIS_\eta^{1,2}$ $R^{h_{2,1}}$: IF $y_\eta^{1,1}$ is $B^{h_{1,1}}$ AND $y_\eta^{1,2}$ is $B^{h_{1,2}}$ THEN $y_\eta^{2,1}$ is $B^{h_{2,1}}, \ldots$ (11)

Layer q: $FIS_\eta^{q,1}$ $R^{h_{q,1}}$: IF $y_\eta^{q-1,1}$ is $B^{h_{q-1,1}}$ AND $y_\eta^{q-1,2}$ is $B^{h_{q-1,2}}$ THEN $y_\eta^{q,1}$ is $B^{h_{q,1}}$, (12)

where $h_{1,1} = h_{1,2} = \ldots = h_{q,u} = \{1,2, \ldots, k^m\}$, u=1,2, $A_1^{h_{1,1}}, A_2^{h_{1,1}}, \ldots, A_n^{h_{q,1}}$ are linguistic variables corresponding to fuzzy sets represented as $\eta_1^{h_{1,1}}(x_i), \eta_2^{h_{1,1}}(x_i), \ldots, \eta_m^{h_{q,1}}(x_i)$, $B^{h_{1,1}}, B^{h_{1,2}}, \ldots, B^{h_{q,1}}$ are linguistic variables corresponding to fuzzy sets represented as $\eta^{h_{1,1}}(y_\eta^{1,1}), \eta^{h_{1,2}}(y_\eta^{1,2}), \ldots, \eta^{h_{q,1}}(y_\eta^{q,1})$, and $\eta_{B^{h_{1,1}}}(y_j^{1,1}), \eta_{B^{h_{1,2}}}(y_j^{1,2}), \ldots, \eta_{B^{h_{q,1}}}(y_j^{q,1})$ are membership function $\eta=\mu$ (non-membership function $\eta=\nu$) values of aggregate fuzzy set for outputs $y_j^{1,1}, y_j^{1,2}, \ldots, y_j^{q,1}$.

The outputs $y_\eta^{1,1}, y_\eta^{1,2}, \ldots, y_\eta^{q,1}$ of particular subsystems $FIS_\eta^{1,1}, FIS_\eta^{1,2}, \ldots, FIS_\eta^{q,1}$ of the tree IHFIS can be expressed by using defuzzification method Center of Gravity (COG) [16]. The outputs of particular subsystems $FIS_\eta^{1,1}, FIS_\eta^{1,2}, \ldots, FIS_\eta^{q,1}$ in each layer of the IHFIS are calculated as follows

$$y_\eta^{r,s}(B^{h_{r,s}}) = (1 - \pi_\mu^{r,s}) \times y_\mu^{r,s}(B^{h_{r,s}}) + \pi_n^{r,s} \times y_n^{r,s}(B^{h_{r,s}}), \text{ for } r = 1,2, \ldots, q, \; s = 1,2. \quad (13)$$

Similarly, it is possible to design and define a cascade IHFIS, and various other, hybrid IHFISs.

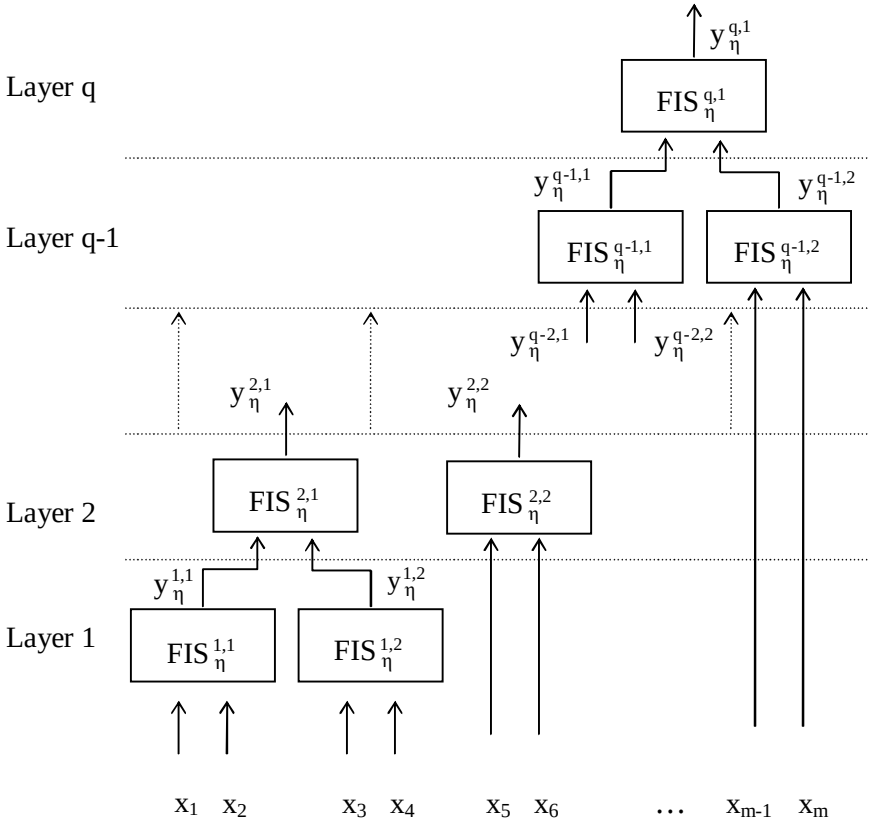


Fig. 2 A tree IHFIS

5. Air Pollution Assessment using Intuitionistic Hierarchical Fuzzy Inference System and Analysis of the Results

Air pollution assessment represents a classification problem. As such it can realized by the tree IHFIS with inputs (parameters) $\mathbf{x}^t=(x_1^t, x_2^t, \dots, x_k^t, \dots, x_m^t)$, m=11, outputs $y_\eta^{1,1}, y_\eta^{1,2}, \dots, y_\eta^{q,1}$ of individual subsystems $FIS_\eta^{1,1}, FIS_\eta^{1,2}, \dots, FIS_\eta^{q,1}$, q=6. The design of specific tree IHFIS results from the recommendation of experts in given field. Thus, it simulates their decision-making process. The design of input (output) membership functions μ and non-membership functions ν is realized by means of clustering algorithms. As an example, the input membership functions μ for input parameters x_1^t and x_2^t of the particular subsystem $FIS_\mu^{1,1}$ are presented in Fig. 3. In a similar manner, the input non-membership functions ν for input parameters x_1^t and x_2^t of the subsystem $FIS_n^{1,1}$ are presented in Fig.4. These functions are designed for an example of intuitionistic index π=0.05.

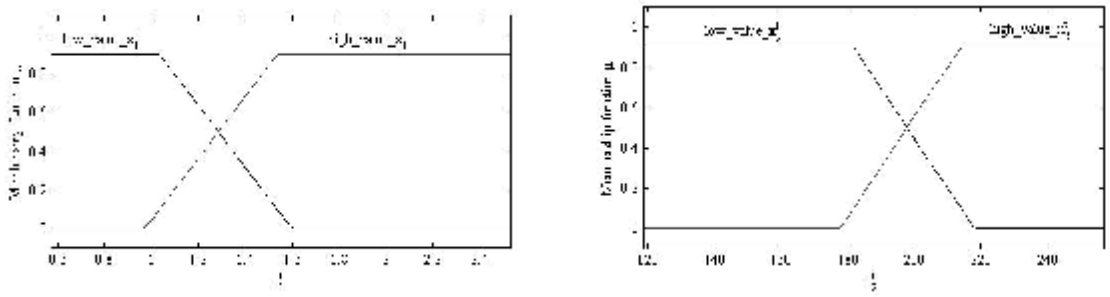


Fig. 3 Input membership functions μ for input parameters x_1^t and x_2^t of subsystem $FIS_{\mu}^{1,1}$

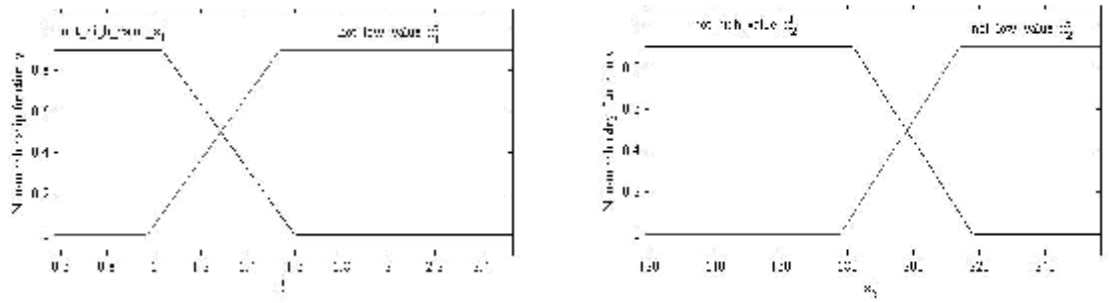


Fig. 4 Input non-membership functions ν for input parameters x_1^t and x_2^t of subsystem $FIS_{\nu}^{1,1}$

Base of IF – THEN rules for subsystem $FIS_{\eta}^{1,1}$ is defined as:

for $FIS_{\mu}^{1,1}$ (14)

$FIS_{\mu}^{1,1}$ R^1: if x_1^t is low_value_x_1^t AND x_2^t is low_value_x_2^t
then $y_{\mu}^{1,1}$ is low_value_$y_{\mu}^{1,1}$,

$FIS_{\mu}^{1,1}$ R^2: if x_1^t is low_value_x_1^t AND x_2^t is high_value_x_2^t
then $y_{\mu}^{1,1}$ is medium_value_$y_{\mu}^{1,1}$,

$FIS_{\mu}^{1,1}$ R^3: if x_1^t is high_value_x_1^t AND x_2^t is low_value_x_2^t
then $y_{\mu}^{1,1}$ is medium_value_$y_{\mu}^{1,1}$,

$FIS_{\mu}^{1,1}$ R^4: if x_1^t is high_value_x_1^t AND x_2^t is high_value_x_2^t
then $y_{\mu}^{1,1}$ is high_value_$y_{\mu}^{1,1}$.

for $FIS_{\nu}^{1,1}$ (15)

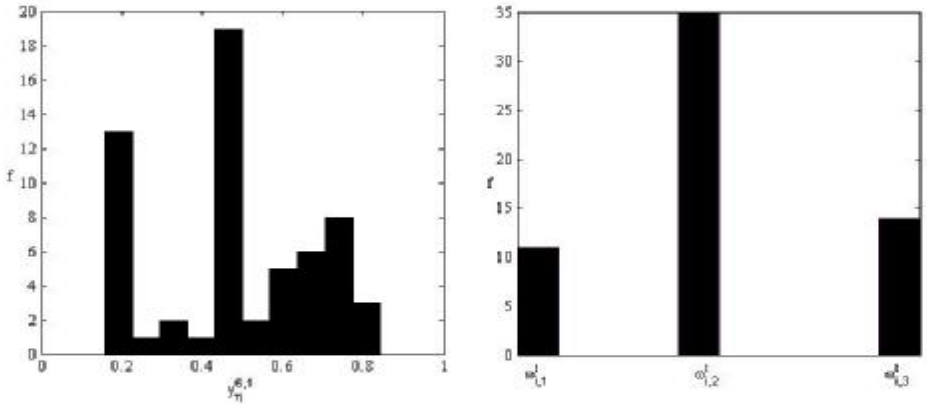
$FIS_{\nu}^{1,1}$ R^1: if x_1^t is not_low_value_x_1^t AND x_2^t is not_low_value_x_2^t
then $y_{\nu}^{1,1}$ is not_low_value_$y_{\nu}^{1,1}$,

$FIS_{\nu}^{1,1}$ R^2: if x_1^t is not_low_value_x_1^t AND x_2^t is not_high_value_x_2^t
then $y_{\nu}^{1,1}$ is not_medium_value_$y_{\nu}^{1,1}$,

$FIS_{\nu}^{1,1}$ R^3: if x_1^t is not_high_value_x_1^t AND x_2^t is not_low_value_x_2^t
then $y_{\nu}^{1,1}$ is not_medium_value_$y_{\nu}^{1,1}$,

$FIS_{\nu}^{1,1}$ R^4: if x_1^t is not_high_value_x_1^t AND x_2^t is not_high_value_x_2^t
then $y_{\nu}^{1,1}$ is not_high_value_$y_{\nu}^{1,1}$.

The inference mechanism of particular subsystems $FIS_{\eta}^{1,1}, FIS_{\eta}^{1,2}, \ldots, FIS_{\eta}^{q,1}$ involves also the process of implication (MIN method) and aggregation (MAX Method) within IF – THEN rules, and the process of defuzzification by COG method of obtained outputs to the crisp values. The output $y_{\eta}^{6,1}$ of the designed tree IHFIS (the frequencies f of the classes $\omega_{i,j}^{t} \in \Omega$ is presented in Fig. 5a. The classification of the i-th district $o_i^t \in O$, $O=\{o_1^t, o_2^t, \ldots, o_i^t, \ldots, o_n^t\}$ in time t to the j-th class $\omega_{i,j}^{t} \in \Omega$, $\Omega=\{\omega_{1,j}^{t}, \omega_{2,j}^{t}, \ldots, \omega_{i,j}^{t}, \ldots, \omega_{n,j}^{t}\}$, (n=60), j=1,2,3 by the tree IHFIS using association index is shown in Fig. 5b. Yearly average values (2001-2006) of measurements are used for the assessment of ten districts in Pardubice micro region.



5a 5b

Fig. 5a The ouptut $y_{\eta}^{6,1}$ of the tree IHFIS (the frequencies f of the classes)

Fig. 5b Classification of the district $o_i^t \in O$ into classes $\omega_{i,j}^{t} \in \Omega$, j=1,2,3 (the frequencies f of the classes) using association index ξ

6. Conclusion

Air pollution assessment is currently realized by methods combining mathematical-statistical methods and expert opinion. They have some limitations which can be overcome using IFSs. Intuitionistic fuzzy sets make it possible to process uncertainty and the expert knowledge. The concept of the IFS can be viewed as an alternative approach to define a fuzzy set. In general, the theory of IFSs is the generalization of fuzzy sets. Therefore, it is expected that IFSs could be used to simulate human decision-making and classification processes and any activities requiring human expertise and knowledge, which are inevitably imprecise or not totally reliable. Based on IFSs, the paper presents the design of tree IHFIS of Mamdani type. The IHFIS defined this way works more effective than the HFIS [14,25] as it provides stronger possibility to accommodate imprecise information and, at the same time, the number of IF – THEN rules is reduced compared to the IFIS. Output of the IHFIS uses the theory of general IFIS presented in [20]. The introduction of association index ξ makes it possible to point out the classification of the i-th district $o_i \in O$ into the j-th class $\omega_{i,j} \in \Omega$ realized by the tree IHFIS initially. The gained results represent the recommendations for the state administration of the city of Pardubice in the field of air quality development. They can also serve as a basis for the municipal crisis management in crises situations. The model was carried out in programme environment MATLAB/Simulink under MS Windows XP operation system.

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SOME GRAPH INVARIANTS RELATED TO THE DISTANCE MATRIX OF A DIGRAPH.

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Abstract: *It is the very usual case that the sbortest paths between all pairs of vertices in a given graph are required. Then the distance matrix D of such graph has to be arranged. In addition some quantities related to the distance matrix D can be useful. The program in the system Mathematica was created to calculate specific quantities for a given directed graph. Further the determinant of the distance matrix and the distance polynomial for a cycle with n vertices were found.*

Keywords: *Digraph, Distance Matrix, Distance Polynomial.*

1. Introduction

The graphs considered here are finite, directed and without loops and parallel (multiple) arcs (edges). A weighted digraph (directed graph) G is a digraph along with a mapping $c: A(G) \rightarrow R$, where $A(G)$ is the set of arcs of the digraph G. An unweighted digraph can be viewed as a weighted digraph with $c(a) = 1$ for any arc a of G. The other notations and terminology are as in the books [1] and [2].

Definition 1. *Let G be a weighted digraph with n vertices. Then the distance matrix of G is defined as n × n matrix D(G) = D =* (d_{ij})*, where*

$$d_{ij} = \begin{cases} \text{the distance from i to j,} \\ 0, \text{ if i = j,} \\ \text{if no path from i to j exists.} \end{cases}$$

The distance from i to j is the weight of the shortest path from i to j.

Definition 2. *Let D be the distance matrix of a digraph G. The distance polynomial of G is defined as* $P(G; x) = det(xI - D)$ *, where I is the unit matrix of the size n × n.*

The distance matrix and the distance polynomial can be defined for undirected graphs in the same way.

The problem of finding of the distance matrix in a graph has a surprising variety of applications. An obvious example is the preparation of tables indicating distances between all pairs of major cities and towns in road maps of the state or region, which often accompany such maps. This type of computation is also virtually invariably required in all urban service system problems related to the location of urban facilities of the distribution on delivery of

goods. It is therefore important to have available a highly efficient method for obtaining these shortest paths.

Křivka and Trinajstić dealt in [4] with the distance matrix and polynomial for simple undirected graphs. They obtained some interesting results.

Theorem 1 ([**4], Proposition 6**). *If there are two vertices with the same neighbourhood in a graph G, then one root of the distance polynomial P*(*G; x*) *is either* –1 *(if the vertices are adjacent) or* –2 *(if the two vertices are not adjacent*).

Theorem 2 ([**4], Proposition 7**). *If G is a path on n*+1 *vertices (n* ≥3*), then* $a_0 = (-1)^n 2^{n-1}$, *where* a_0 *is a constant coefficient of P*(*G; x*), *i. e.* $a_0 = det(-D)$.

Theorem 3 ([**4], Proposition 9**). *If G is a star with n vertices, then*

$$P(G; x) = (x + 2)^{n-2} (x^2 - 1 - (n-2)(2x + 1)) .$$

Theorem 4 ([4], Proposition 10). *If G is an circuit on n vertices, then at least one root of the distance polynomial P*(*G; x*) *is zero.*

2. Program for calculation of the distance matrix and related quantities

First, we mention the most known algorithms. Almost all algorithms are for finding the distances from a fixed vertex of a digraph to the rest of the vertices. If the given digraph is unweighted then one can use the simple and fast breadth - first search algorithm. When G is an arbitrary digraph, but its weights are nonnegative, Dijkstra's algorithm solves the problem. When the weights may be negative, but no negative cycle is allowed, the Bellman-Ford-Moore algorithm can be applied. This algorithm has also the following additional useful property: it can be used to detect a negative cycle (if it exists). If we are interested in finding the distances between all pairs of vertices of a weighted digraph *G*, we can apply the previous algorithm from every vertex of *G*. Hovever, there is a much faster algorithm, due to Floyd and Warshall (more details in [6], pp. 45-58).

We used Floyd's algorithm to create a program for the calculation of the distance matrix of a weighted digraph. This is based on the system Mathematica for its good manipulation of ∞ and therefore the algorithm could be used simply enough. The language Pascal has been used with respect to need an interactive drawing of a given digraph. The program proceeds as follows.

```
MatrixAdjacencyToMatrixWeights::usage :=
"MatrixAdjacencyToMatrixWeights[m] computes the matrix D0 of weights
of arcs of the adjacency matrix for the related unweighted digraph."
```

```
FloydAM::usage := "FloydAM[mat] computes the distance matrix D
of an arbitrary unweighted digraph given by its adjacency matrix."

FloydMW::usage := "FloydW[mat] computes the  distance matrix D
of an arbitrary weighted digraph given by its matrix D0."

MatrixAdjacencyToMatrixWeights[mat_]:=
Module[{m = mat,  n=Length[mat]}, Print[n];
    Do[
      If[i=!=j, If[ m[[i,j]] == 0, m[[i,j]] = Infinity ] ]
      ,{i,1,n},{j,1,n}
     ]; m
    ]

FloydAM[mat_]:=
 Module[ {m = MatrixAdjacencyToMatrixWeights[mat], n=Length[mat]},
      Do[
        Do[
          m[[i,j]] = Min[ m[[i,j]], m[[i,k]] + m[[k,j]]]
         ,{i,1,n},{j,1,n}
         ]
         , {k,1,n}
        ]; m
     ]

FloydMW[mat_]:=
 Module[ {m = mat, n=Length[mat]},
      Do[
        Do[
          m[[i,j]] = Min[ m[[i,j]], m[[i,k]] + m[[k,j]]]
         ,{i,1,n},{j,1,n}
         ]
         , {k,1,n}
        ]; m
     ]
```

For an illustration, the distance matrix and related invariants were calculated for the digraph in Figure 1.

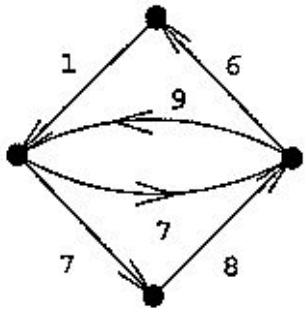

Fig. 1

$$D_0 = \begin{vmatrix} 0 & 1 & \infty & \infty \\ \infty & 0 & 7 & 7 \\ 6 & 9 & 0 & \infty \\ \infty & \infty & 8 & 0 \end{vmatrix}, \qquad D_3 = \begin{vmatrix} 0 & 1 & 8 & 8 \\ 13 & 0 & 7 & 7 \\ 6 & 7 & 0 & 14 \\ 14 & 15 & 8 & 0 \end{vmatrix}$$

det D = –27916,

eigenvalues {–8.558 – 6.007i, –8.558 + 6.007i, –9.569, 26.685},

$P(G;x) = x^4 - 439x^2 - 6242x - 27916$.

3. The case of a cycle

Gradshteyn and Ryzhik defined and expanded circulant matrices and their determinants.

Theorem 5 ([3], pp. 1111 - 1112). *Let x_j, $j = 1, \ldots, n$, be complex numbers. Then*

$$\begin{vmatrix} x_1 & x_2 & \ldots & x_n \\ x_n & x_1 & \ldots & x_{n-1} \\ & & \ldots & \\ x_2 & x_3 & \ldots & x_1 \end{vmatrix} = \prod_{j=1}^{n} (x_1 + x_2 e_j + x_3 e_j^{\,2} + \mathbf{L} + x_n e_j^{\,n-1}),$$

where ε_j, $j = 1, \ldots, n$, are the n-th roots of unity. The eigenvalues λ_j of the corresponding $n \times n$ circulant matrix are

$$\lambda_j = x_1 + x_2\varepsilon_j + x_3\varepsilon_j^2 + \ldots + x_n\varepsilon_j^{n-1}.$$

Lemma. *Let $\varepsilon \neq 1$ be any complex number. Then*

$$e + 2e^2 + \mathbf{L} + ne^n = \sum_{k=1}^{n} ke^k = \frac{e}{(1-e)^2}(1-(n+1)e^n + ne^{n+1}).$$

Proof. The statement can be easy proved by induction on *n*.

It is more complicated to find the determinant of the distance matrix, the eigenvalues of this matrix or the distance polynomial for an arbitrary digraph. Therefore we will consider only a cycle C_n with *n* vertices as the case of the simplest strong connected digraph.

Theorem 6. *For a cycle C_n with $n \geq 2$ vertices the following statements hold.*

1.

$$det\, D(C_n) = (-1)^{n-1}\binom{n}{2}n^{n-2},$$

2.

$$P(C_n; x) = \left(x - \binom{n}{2}\right)\prod_{j=2}^{n}\left(x - \frac{e_j}{(1-e_j)^2}(1-ne_j^{n-1} + (n-1)e_j^n\right),$$

where ε_j, $j = 1, \ldots, n$, are the n-th roots of unity,

3. the matrix $D(C_n)$ has the eigenvalues

$$x_1 = \binom{n}{2}, x_j = \frac{e_j}{(1-e_j)^2}(1-ne_j^{n-1} + (n-1)e_j^n),$$

for $2 \leq j \leq n$.

Proof. It is easy to see that the distance matrix for a cycle C_n has the form

$$D(C_n) = \begin{pmatrix} 0 & 1 & 2 & \ldots & n-1 \\ n-1 & 0 & 1 & \ldots & n-2 \\ & & \ldots\ldots & & \\ 1 & 2 & 3 & \ldots & 0 \end{pmatrix}.$$

1. $$det\ D(C_n) = \begin{vmatrix} 0 & 1 & 2 & 3 & \dots & n-1 \\ n-1 & 0 & 1 & 2 & \dots & n-2 \\ n-2 & n-1 & 0 & 1 & \dots & n-3 \\ & & & & \dots & \\ 1 & 2 & 3 & 4 & \dots & 0 \end{vmatrix}$$

First, we subtract the (k+1)-st row from the k-th, for k = 2, ..., n – 1, and the first row from the n-th. We get

$$\begin{vmatrix} 0 & 1 & 2 & 3 & \dots & n-1 \\ 1 & -(n-1) & 1 & 1 & \dots & 1 \\ 1 & 1 & -(n-1) & 1 & \dots & 1 \\ & & & & \dots & \\ 1 & 1 & 1 & 1 & \dots & -(n-1) \end{vmatrix}$$

Afterwards we subtract the first column from all the following ones

$$\begin{vmatrix} 0 & 1 & 2 & 3 & \dots & n-1 \\ 1 & -n & 0 & 0 & \dots & 0 \\ 1 & 0 & -n & 0 & \dots & 0 \\ & & & & \dots & \\ 1 & 0 & 0 & 0 & \dots & -n \end{vmatrix}$$

and finally expand with respect to the first row. Then

$$\det D(C_n) = -1(-n)^{n-2} - 2(-n)^{n-2} - \mathbf{L} - (n-1)(-1)^{n-2} = (-1)^{n-1}\binom{n}{2}n^{n-2}.$$

2. By Definition 2 and using Theorem 5 we get

$$P(C_n; x) = \begin{vmatrix} x & -1 & -2 & \dots & -(n-1) \\ -(n-1) & x & -1 & \dots & -(n-2) \\ & & \dots & & \\ -1 & -2 & -3 & \dots & x \end{vmatrix} =$$

$$= \prod_{j=1}^{n}.(x - e_j - 2e_j^{\ 2} - \mathbf{L} - (n-1)e_j^{\ n-1}) = \prod_{j=1}^{n}(x - \sum_{k=1}^{n-1} ke_j^{\ k}).$$

As one of the root of unit equals 1 for any positive integer n (e.g. $e_1 = 1$) we can write

$$P(C_n; x) = \left(x - \sum_{k=1}^{n-1} k \right) \prod_{j=2}^{n-1} \left(x - \prod_{k=1}^{n-1} k e_j^{\,k} \right)$$

Using Lemma we have

$$P(C_n; x) = \left(x - \binom{n}{2} \right) \prod_{j=2}^{n} \left(x - \frac{e_j}{(1-e_j)^2} (1 - n e_j^{\,n-1} + (n-1) e_j^{\,n} \right)$$

3. We obtain eigenvalues immediately as the roots of the distance polynomial from its expression in the previous factorization.

Table 1: The distance polynomial $P(C_n; x)$ of a cycle C_n and the determinant of the distance matrix $D(C_n)$ for small values n

n	$P(C_n; x)$	$\det D(C_n)$
2	$(x - 1)(x + 1)$	–1
3	$(x - 3)(x^2 + 3x + 3)$	6
4	$(x - 6)(x + 2)(x^2 + 4x + 8)$	–96
6	$(x - 15)(x + 9)(x^2 + 6x + 36)(x^2 + 6x + 12)$	–19 440

It is obvious from Theorem 6 that only one eigenvalues is real for odd n and just two eigenvalues are real for even n.

4. Concluding remarks

After small arrangement the created program works for undirected graphs, too. Then the distance matrix can be used to compute another useful invariants of a graph G, that are related to the center of G. These invariants are for example the eccentricity of a vertex in G, the radius and the diameter of a graph G or Wiener's index which is defined as the sum of all nondiagonal entries of the distance matrix. This index is often used in chemistry.

From the mathematical point of view the main result of this contribution is the calculation of invariants related to the distance matrix for a directed cycle with n vertices. An interesting problem is also to investigate properties of these invariants for other classes of strong connected digraphs, such as distance--regular graphs, strong tournaments and so on. We found in [5] some invariants for digraphs with the companion matrix as their adjacency matrix.

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QUALITY STANDARDS AS AN IMPLEMENTATION TOOL OF ETHICAL PRINCIPLES WITHIN SOCIAL SERVICES

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Abstract: *Quality standards of social services are one of the three key elements of the system of quality guarantee in social services. They themselves do not initiate new ethical topics, but they put emphasis on some areas and they oblige the provider to document them into the internal materials of the provider. Fulfilling ethical principles during the provision of social services does not only mean seeking a solution that is sufficient, ethics also incorporates the perspective of justice and the common good. By quantifying the measurement of fulfillment in regards to the individual quality standards criteria we can evaluate how we are succeeding in implementing ethical principles into social services.*

Key Words: *Quality Standards, Criterion, Ethics, Social Services, Evaluation, Points.*

1. Introduction

New legislation applying to social services, especially act no.108/2006 Sb. about social services, subsequently amended, does not mean only new rights and duties for the participants in the system of social services, but it also seeks to alter their behavior patterns and mutual relations. It implements new institutions necessary for the professionalization of social services, one of the institutes being the obligation to fulfill quality standards of social services. Legislation modifying social services thus creates primary conditions for the enforcement of fundamental rights and freedoms modified by constitutional laws and the principles of the European social model.

Fulfilling ethical principles during the provision of social services cannot be narrowly understood only as looking for a solution that is merely satisfactory. Rather, it is necessary to accentuate in a broader sense the requirement for the ethical correctness of the sought solution and sensitiveness to bases that play a supportive role in the proposed solutions.

2. Ethics in Social services

Ethics deals with what is right and what is wrong. It analyzes moral decisions made by people and ways they try to give reasons for those decisions [1]. In the broadest sense, ethics is a study of human behavior. Within this context we can divide ethics into two different levels:

a) **Personal attitude and experience** – these represent fundamental behavioral patterns

b) **Institutional rules** – in our branch, activities and, in a broader sense, in society

Specifics of ethics in social services:

- Distance from a particular and thoroughly evaluated work situation regarding the borders
- Abstract thinking leading to the creation of a scenario for an ethically acceptable solution to a professional situation
- Analysis of a presupposed scenario or an already implemented solution from the perspective of all ethically significant influences on the evaluation of the given solution

The conception of ethics proposed in this way gives enough space for the so-called 'Critical Social Practice'. *'The purpose of ethics in social work is in the first place to allow the social worker to recognize the relevant principles and values and to work with them in the appropriate context'* [2].

3. Selected quality standards of social services – the standard no. 1 and 2

Quality standards of social services do not initiate new ethical topics, but they do put emphasis on some areas and there is an obligation to document them into the internal materials of the provider of social services (guidelines, rules, organizational regulations, etc.).

The provider's guide for implementation of quality standards of social services [3] within **the standard no.1** (hereafter referred to only as 'the Guide') incorporates ethical aspects into the practice specifically within the frame of the **criterion 1.a** "Principles of the provision of social services". These principles capture and express the values by which workers are to abide by when working with users and, generally, during the provision of social services. The values can be, for example, stated in the **ethics code** that would be created by the workers of a particular service as a part of the culture in which they are working. All of the workers of the provider should participate in formulating these principles, the ethics code and other materials of this kind. Ethical behavior is not connected only with external rules of behavior within the frame of ethics codes, but also with the subjective feelings of the social worker regarding as to how the social worker should act so as that their behaviour and decision-making processes are also ethical [4]. The main evidence of fulfillment of the ethic principles is in securing the dignity of the users of social services. Emphasis is put especially on the following values: fulfillment of the rights of the users, respecting the choices made by the users, the individualization of support, concentration on the whole, and flexibility.

Respecting the rights and rightful interests of users by the provider of the service during its arrangement, continuation and termination is dealt with in the **standard no. 2**. The Guide states that the protection of the rights of users of services is the key principle in the activities of providers of social services and measurement of their quality. In all activities and at all stages of the continuation of the provision of a service it is necessary to concentrate on the prevention of the prospective violation of the rights of users [5]. The provider is obliged by the **criterion 2.a** to make written rules in order to avoid situations in which in connection with the provision of a service the violation of the fundamental human rights could occur. According to the **criterion 2.b** the provider is obliged to define situations in which there could occur a conflict of interests for the provider or worker of the facility with the interests of the users, and to define written internal rules that avoid possible conflicts of interests. The aim of the criterion is, on the basis of definition of problematic areas and situations and by using quality internal regulations, to make and implement rules that lead to avoidance of conflict of interests from the side of the facility of its employees with the interests of the users of the service. Should the conflict of interests have already occurred, the provider has to know with the use of their internal documents and other rules (e.g. ethics code) how to solve the existing conflicts and how to remove them, with regard to the interests of the user of the service. Consequences impending to the worker upon violation of the users rights are stated according to the seriousness of the violation on the level of:

- ethical (pressure by the public opinion, conscience, criticism by co-workers)
- civil-law [6] (litigation with the provider)
- labour-law (decrease or removal of personal appreciation, written censure, immediate termination of employment)

- administrative-law (administrative deliction, financial sanction, transgression)
- criminal-law (recognition of constituent elements of a particular crime, and the corresponding punishment) [7]

It is necessary to point out that conflicts of interests within the terminology of the quality standards of social services and the **dilemmatic situation** or **ethical dilemma** do not necessarily express themselves the same way. Whereas an ethical dilemma occurs when two (or more) moral values are on the same level or reasoned in contradiction of each other and the social worker has to choose which option he will implement, not every conflict of interests must automatically involve ethical values. And not every non-ethical decision or violation of the ethics code may lead to sanctions within the body of law.

4. Selected criteria of the quality standard of social services no. 1 – criterion 1.a, no. 2 – criterion 2.a, 2.b

Standard no. 1 Goals and methods of provision of social services

Criterion 1.a (fundamental criterion)

"The provider has defined in writing and published the mission, goals and principles of the provided social service and the constituencies of people that the social service is intended to, in compliance with fundamental principles of the provided social service that are defined by law, with the type of the social service and with individually given needs of people that the social service is provided to; the provider proceeds in accordance with this mission, goals and principles."

Standard no. 2 Protection of human rights

Criterion 2.a (fundamental criterion)

"The provider has processed written documentation with internal rules for avoidance of situations in which in connection with the provision of a social service the violation of the fundamental human rights and freedoms could occur and for procedures in case violation of these rights have already occurred; the provider proceeds in accordance with these rules."

Criterion 2.b (fundamental criterion)

"The provider has processed written documentation with internal rules defining situations in which the conflict of interests of the provider with the interests of the people to whom the provider provides the social service could occur, including rules that solve these situations; the provider proceeds in accordance with these rules [8]*"*.

Evaluation of the fulfillment of criteria abides by the methodology of inspections (on a scale from 0 up to 3 points, while the figure 0 is the lowest evaluation possible).

0 points = (non-conformity) the criterion is **not fulfilled**, there is no evidence of fulfillment of the criterion, there is almost no activity within the observed area, some good thoughts or ideas are in existence, but they are not being implemented.

1 point = (partial conformity) the criterion is **fulfilled partially**, there are certain individual evidences of fulfillment of the criterion, the criterion is fulfilled on an occasional basis in some aspects of the observed area, but these aspects are not documented and systematically observed.

2 points = (predominant conformity) the criterion is **fulfilled sufficiently**, fulfillment of the criterion is described in the provided explicit evidences of sufficient solution of the observed

area, application of a systematical approach, practice is regularly and routinely reviewed and improved upon.

3 points = (conformity) the criterion is **fulfilled excellently**, there is comprehensive evidence of the fulfillment of the criterion, there is evidence of excellent results and approaches towards a solution and improvement in the predominant majority of aspects in the observed area, solution of situations in documents as well as in practice is in compliance with the law [9].

Note: In case of a fundamental criterion, evaluation has to be either 2 or 3 points so that the criterion would be fulfilled. There are totally 15 quality standards of social services in the public notice no. 505/2006 Sb., and those are divided into 48 criteria out of which 17 are fundamental. Maximum number of points that can be reached is 144.

Tab.1: Fulfilling the criterion 1.a – of the quality standard of social services in the year 2008 in the Pardubice region

Standard no. 1	**Evaluation 0 points**	**Evaluation 1 point**	**Evaluation 2-3 points**	**Total number of inspections**
Criterion 1.a	0	15	11	26

Source: Total evaluation of inspection activities for the year 2008 in Pardubice region [10].

Interpretation of the result:

57,69 % of providers did not fulfill the **criterion 1.a**, at least for 2 points. None of the providers was evaluated for 0 points. 15 providers were evaluated for 1 point, which corresponds to partial fulfillment of the criterion.

Tab. 2: Fulfilling the criterion 1.a – quality standard of social services for the period from 1 to 9/2009 in Pardubice region

Standard no. 1	**Evaluation 0 points**	**Evaluation 1 point**	**Evaluation 2-3 points**	**Total number of inspections**
Criterion 1.a	1	4	14	19

Source: Total evaluation of inspection activities for the period from 1 to 9 /2009 in Pardubice region [11].

Interpretation of the result:

Within the period from January till September 2009 26,32 % of providers did not fulfill the **criterion 1.a**. Even though in comparison with the year 2008 there is one provider that was evaluated for 0 points, it is evident that the quality within this observed point is increasing.

Tab. 3: Fulfilling the criterion 2.a, 2.b – quality standard of social services for the year 2008 in Pardubice region

Standard no. 2	**Evaluation 0 points**	**Evaluation 1 point**	**Evaluation 2-3 points**	**Total number of inspections**
Criterion 2.a	4	9	13	26
Criterion 2.b	2	9	15	26

Source: Total evaluation of inspection activities for the year 2008 in Pardubice region [10].

Interpretation of the result:

In 2008 the **criterion 2.a** was not fulfilled by 50 % of providers and the **criterion 2.b** was not fulfilled by 42,31 % of providers. Quality standards of social services are mutually blended and in terms of contents they are connected to each other. It is not easy to consider one standard more important that the other one, nevertheless, the standard no. 2 deals with protection of human rights. From the above-mentioned table it is evident that in almost 50 % of all conducted inspections of providers of social services in 2008 the protection of human rights was not sufficiently secured, or written rules were not created on the required level.

Tab. 4: Fulfilling the criterion 2.a, 2.b - quality standard of social services for the period from 1 to 9/2009 in Pardubice region

Standard no. 2	**Evaluation 0 points**	**Evaluation 1 point**	**Evaluation 2-3 points**	**Total number of inspections**
Criterion 2.a	2	5	12	19
Criterion 2.b	3	1	15	19

Source: Total evaluation of inspection activities for the period from 1 to 9 /2009 in Pardubice region [11].

Interpretation of the result:

Within the period from January to September 2009 **the criterion 2.a** was not fulfilled by 36,84 % of providers and **the criterion 2.b** was not fulfilled by 21,05 % of providers. In this case it is evident that there was a positive change and from the qualitative point of view social services are heading in the right direction.

The provider evaluates what rights can be realized by the user on their own, in fulfillment of which rights the user will need assistance from the provider in and, eventually, fulfillment of which rights for a particular user could not be fully ensured.

If they do not succeed in fulfilling some law entirely, due to whatever reason from the side of user or provider, this situation should be described, including the reason why the law cannot be fully realized and procedures that may lead to improvement of the situation [12].

But social work deals with such complex and individual life situations of clients that it is not possible to entirely exclude contradictions of ethical and legal requirements.

Professionalism in social work means an ability to handle the uncertainty of a choice [13]. In social work certainty in the decision-making process mostly cannot be reached, but it can be approached.

Tab. 5: Decisions of a social worker can be:

Decision	With ethical standards	With legal regulations
1)	In compliance	In compliance
2)	At variance	At variance
3)	At variance	In compliance
4)	In compliance	At variance

Source: Reamer F. G., Ethical and Legalm Standards in Social Work: Consistency and Conflict, Families in Society, The Journal of Contenmporary Social Services Volume 86, No. 2, 2005, p. 163 – 170, [14].

Situation no. 1. The decision of a social worker is in compliance with ethical standards as well as legal regulations. The situation does not raise a moral dilemma. For example, a social worker informs a user about their rights and duties. The basic social consultancy, in accordance to act no. 108/2006 Sb. about social services, subsequently amended, has to be provided by every social service.

Situation no. 2. The decision is not in compliance with ethical standards, nor with legal regulations. This situation does not have to necessarily raise a moral dilemma, either. For example, a social worker violates a legally bound obligation of discretion and conveys the personal or sensitive data of a particular user to a third person.

Situation no. 3. The decision of a social worker is in compliance with legal regulations, but it is at variance with the principles of the profession. In this case a social worker may experience a serious dilemma. For example, a social worker strictly follows the procedure in accordance to a valid internal direction and upon a user's behavioral offence the social worker cancels the user's contract of provision of a particular social service (the social worker evaluates the situation as the reason for cancellation), even though s\he is aware that in the immediate perimeter an alternative social service is not provided.

Situation no. 4. The decision is consistent with ethical standards, but not with legal regulations. In this situation there is a serious dilemma. For example, the provider has only one social worker that is, in relation to a particular person interested in a given social service, aware of their vocational and professional limitations, but is not allowed to refuse the person interested and to "forward" them to another adequate social service because there is not a thoroughly defined reason for refusal in accordance to the law of social services. The social worker still proceeds by securing the help of a different provider.

5. Conclusion

Fundamental principles of the quality of social services in accordance to a new enactment are the principle of the protection of the human rights of the user, the principle of individualization of a service, the principle of professionalism and the principle of operational security. And it is the quality standards of social services that should be the fundamental elements for an increase even in quality control.

Without intending to draw generally applicable conclusions out of the existing results and the comparisons of the fulfillment of the criteria 1.a, 2.a, 2.b of the quality standards of social services, it is evident that social workers are aware more intensely of the ethical aspects of their role and in the implementation of the contents of the standards into practice so that the application of ethical principles in social services takes place.

Greater responsibility, tolerance, empathy, an ability to listen and communicate, as well as to act in an ethical way are thus rightly expected particularly of people in the roles of assisting professions. They can thus significantly help with the elimination of the negative effects that disturb us within our society, particularly by the disconnection of the modern citizen from timeless values and the violation of social relationships and the values of everyday life.

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BALANCED SCORECARD AS AN INSTRUMENT FOR RESPONSIBLE MANAGEMENT

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***Abstract**: Balanced Scorecard is reputable and widespread strategic management system that is, however, often criticised from the perspective of corporate social responsibility. Therefore the paper takes closer look at the different possibilities of integrating environmental and social aspects to corporate strategy. The main aim is to demonstrate how Balanced Scorecard could be adapted to become a more responsible framework.*

***Keywords:** Balanced Scorecard, Corporate Social Responsibility, Performance Management, Strategy.*

1. Introduction

Enforcement of ethics and ethic thinking into company managements creates a need but also a space for searching new attitudes in management and application of innovative approaches and management tools. In recent years, we have been encountering management methods responding to the boom of economic and social relations within a company. Expressions, such as Triple bottom line, Corporate Governance, or Corporate Social Responsibility (CSR), highlight the shift of paradigm stating that business is just a way how to quickly achieve profit.

Today, we can find CSR issues on the web sites of more than 80 percent of the Fortune 500 companies. [BHATTACHARYA, SEN 2004] However, CSR manifestations do not say anything about real CSR activities. If we want to go beyond rhetoric of Corporate Social Responsibility to its practical application in all corporate activities, we must achieve the social and environmental aspects to be anchored in manager thinking and strategic management, which have the main impact on corporate decision-making process and conduct.

The most companies, however, are still facing a challenge how to implement Corporate Social Responsibility in their specific environment. Nevertheless it is necessary to continue in effective and systematic use of methods applied so far. Can they find the answer in an implementation of strategic management system based on Balanced Scorecard (BSC)? Can we consider BSC to be an applicable comprehensive framework for corporate responsible development?

Before any characteristics of BSC basic principles and procedures, let's consider the causes which have lead to its development and relatively wide distribution. It should be noted that ethic management requires respecting both quantitative as well as qualitative attributes of economic, social, technical and political aspects managed. Within the integrate imaging of corporate management effectiveness, both quantitative and qualitative values and attributes of corporate actions, that can achieve the program and company performance goals only if merged, should be connected in to a system. [DYTRT, STRITESKA 2009, p. 131]

It was the increasing critique of existing practice, using traditional corporate performance indicator systems based only on financial data, which became a first incentive for BSC creation. BSC was upgraded after some time to become a management performance system used for management and implementation of corporate strategy. This modification has resulted from

empiric findings that not all strategic intentions had been met. According to some authors, only 10% companies implement their strategies. [NIVEN 2003, p. 10] Based on this evaluation, new procedures, which remove barriers arising between strategy formulation and implementation, shall be introduced into strategic management.

Corporate Social Responsibility requires a holistic approach to strategic management and thinking. BSC philosophy allows both individuals and the company to make everyday decisions based on values and measures which are designed to support financial, social and community performance of a company.

2. The Balanced Scorecard Method

The balance scorecard model was introduced in the early 1990s as a part of a management system using non-financial as well as financial measures in managing a company and aligning these measures with the company's strategic objectives. The benefit of the model lies in establishing a framework in which the culture and direction of an organization can be translated into strategies that are actionable, specific and measurable. [ROHM 2004] The element presumption behind the BSC is simple – measurement motivates.

A Balanced Scorecard initiative begins with identifying strategic themes derived from the organization's mission and vision. Strategic themes are then developed by viewing the organization from four different perspectives: Customer, Financial, Internal Processes, and Learning and Growth. The BSC's perspectives could be briefly characterized as follows.

- *The financial perspective* - gives the answer to the question of what financial results the company must achieve to satisfy its shareholders. Financial performance measures play a double role. Firstly, they show whether the implementation of strategy leads to expected economic improvements. Secondly, they are the endpoint of cause and effect relationships flowing from other perspectives.
- *The customer perspective* – defines what value advantage the company must offer their customers to succeed in the market. This perspective enables to formulate a customer and market oriented strategy.
- *The internal process perspective* – identifies all key activities and critical processes for creating the value expected by the customers and for meeting the objectives of shareholders. Important difference is the inclusion of innovative processes.
- Finally, *the learning and growth perspective* – describes the infrastructure of company necessary for achievement of long-term success. Employee and organizational infrastructure represent the thread that connects the other perspectives of BSC. Success in the other three perspectives depends largely on the qualification and motivation of employee as well as on information systems.

In building a BSC, the strategic objectives are presented in the form of a strategy map. Strategy map enables organization to graphically link strategic objectives, and illustrating the cause-and-effect relationship between them. The set of quantitative and qualitative measures or indicators of success for each strategic objective are then identified.

BSC method distinguishes between lag and lead indicators. A lag measures are defined as one that reflects on outcome, or present-day bottom-line result. Lead measures are defined as those that drive future results or success. The lagging measures without leading measures do not communicate how the results are to be accomplished. The combination of lag and lead

measures allows a company to look ahead instead of only looking back. Determining the best measures that precise assess whether or not is the strategy achieving is one of the more challenging aspects of the BSC process.

With the measures defined, setting targets for each of them follows. The targets should identify the present performance state and desired outcome. The difference between current level of performance and optimal or future performance is called performance gap. To close these gaps specific strategic initiatives are required. It is important to emphasize that the initiatives do not represent the focus of the BSC, but the tactical part of operational management. [DAWE 2007] When BSC is created, it is necessary communicate the performance information with staff and middle management. Corporate BSC is also possible cascading for each level of organization and connected individual scorecards with remuneration policy.

Most critiques of BSC relies on the stakeholder theory of the firm. According to some authors the traditional model does not explicitly represent the concerns of key stakeholders. [KAPLAN, NORTON 2005, p. 40] The BSC must be used as a flexible framework. Therefore Woerd and Brink argue [2004, p.177] that all kinds of CSR elements are open for discussion.

3. Adapting a BSC model to the responsible framework

Traditional perspectives of BSC are recommended directly by the authors of concept only as a certain template. Balanced Scorecard can be bound in this context with a responsible management and stakeholder approach, allowing the company first to identify important engaged groups and their requirements that can affect or be affected by the result, strategic decision, plan and process leading to this result. Efforts are made afterwards to meet and interface established requirements.

Several authors have pointed at possibilities to create well-established Balanced Scorecard into a scorecard that enables integrate responsibility into the strategy. [see CRAWFORD, SCALETTA 2005] The view of company is necessary to complement with further dimensions, such as corporate culture, social and environmental aspects and long-term economic efficiency.

An area of culture should be focused on effort that is attended to building a flexible corporate culture, including indicators of employee commitment and responsible leadership. It is important to place emphasis on interconnection of personal, current and desired values, which are unique to each company. If this connection succeeds, at least in part, it will contribute to an increase of creativity, teamwork, corporate identity and last but not least also to economic success. Interesting inspiration can provide also the index of cultural entropy. Cultural entropy indicates the number of potentially limiting values in the different levels of contemporary culture. [see KLÍROVÁ, KAVALÍŘ 2008, p. 49] In other words, it represents the amount of energy consumed by the people in an organization that is not available for productive work. Cultural entropy arise when in organization is lack of coherence, lack of focus, lack of clarity and lack of trust. The degree of cultural entropy is measured by looking at the proportion of votes for potentially limiting values in the current culture. [BARRETT 2006, p. 116]

Classification of social aspects must be based on identification of key stakeholders. Indicators could be focused on relations with the local community, expenses on social initiatives, charitable donations and workforce diversity (gender, race, age). Within the scope of environmental field should be identified any environmental harm arising from activities and production of company. This area may include indicators aimed at recycling of waste,

emissions, material and energy consumption, or direct impacts on nature and landscape. The example of such measures could be recycling revenues, number of green products, number of ISO certified suppliers or % employees trained in environmental issues. [see more PRAŠNIKAR 2006, p. 334]

Economic efficiency has to be achieved on the basis of ethical and responsible management. Transparency of partial economic effects gives a precondition for the long-term prosperity and stability of the organization.

Responsibility, ethics and creativeness can be integrated into BSC in various ways. We however must always proceed from the overall company evaluation which should be a source of data for "sub management" needs. Defined liability dimensions can be introduced into general four perspectives through goals and measures focused on these areas or through renaming traditional perspectives so that they explicitly express the interests of key stakeholders. [1] If the company feels that creation of strategy with CSR elements coming out from relationship with some key stakeholder is reasonable to renamed one of the perspective.

Another option is to add dedicated perspective to the existing four. Woerd and Brink [2004, p. 177] suggest to complete the model with the Society & Planet perspective to become on equal footing with Profit.

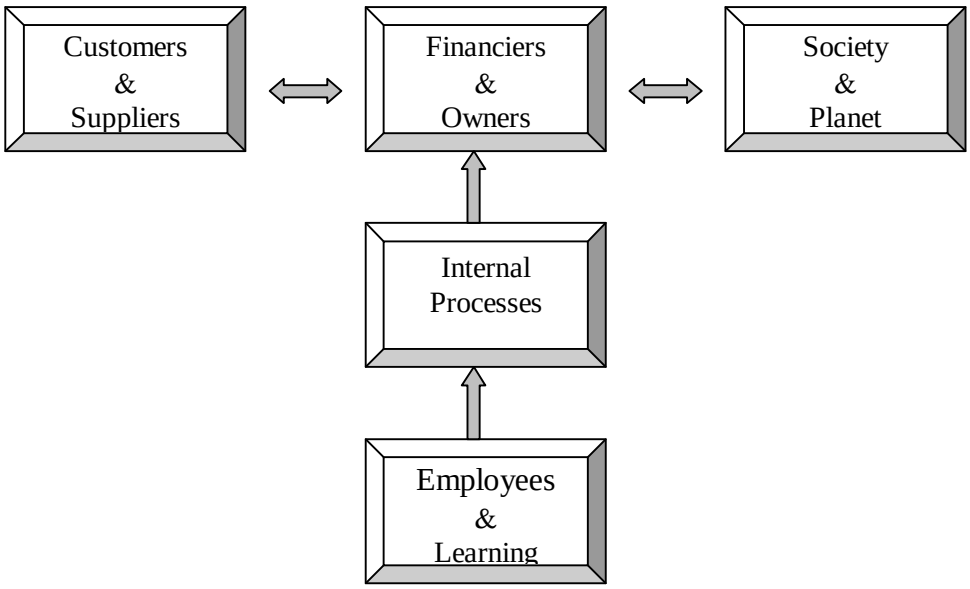

Figure 2: Responsive Business Scorecard
Source: adapted from WOERD, BRINK 2004, p. 178

In this format the three pillars of CSR (People, Planet and Profit) are clearly defined. Interesting inspiration how to adapt the BSC could be also provided by Fidge [2002, p. 274] that introduced sustainable balanced scorecard with additional non-market perspective. According to him the process of formulating SBSC has to meet following requirements:

- the process of creating scorecard must lead to an integration of environmental and social management into business management,

[1] Such examples we can find in automotive industry where one of the perspectives is renamed as supplier.

- the developing of scorecard must meet the unique characteristics and requirement of the strategy and the environmental and social aspects of a company must not be generic,
- environmental and social aspects of a company must be incorporated according to their strategic relevance.

By this way all strategically relevant economic, environmental and social aspects could be integrated in the general management system. As already mentioned above, the next step is to define indicators, targets and initiatives in order to asses the progress in corporate performance. Afterwards BSC could be a powerful tool for managing, measuring and alignment of CSR elements in company.

4. Conclusion

Balanced Scorecard appears today as an innovation of management practice, which creates a precondition for comprehensive evaluation of corporate actions both in terms of quantity as well as quality. The adapted framework can help guide companies in not only defining and implementing their CSR initiatives, but also managing and communicating the effectiveness of these initiatives.

But it depends on an approach of users who in the context of application of this method should not withdraw their experience achieved from the previous use of today already obsolete methods. We are aware of the generally known experience that management method is not a goal but a tool to achieve company goodwill. Necessary is to stress that BSC is a open concept, which each company allows to choose way of environmental and social aspects integration based on their unique and specific conditions.

It is frequently argued that CSR needs to move from being a peripheral activity to become incorporated in all core business functions. [PADERSEN, NEERGAARD 2008, p. 10] The approaches featured in this paper can help companies to develop management framework that integrated CSR in corporate strategy. Looking at the limitations of the paper, the conclusions are mainly based on theoretical findings. In order to implement such a responsible strategic framework in practice, it is necessary to carry out more research works and pilot studies.

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THE MEANINGFUL LEARNING AND TEXT VISUALIZATION

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Abstract: *This deal with concept of meaningful learning, especially process of learning based on visualization of concepts and relations between concepts. Everybody who needs to study must read many texts. Understanding the meaning of text is the main criterion of studying success. For better understanding we can use text visualization to gain better organization of our knowledge. The aim of this article is to bring an idea about meaningful learning and it also to bring experiences with model for text visualization.*

Keywords: *Knowledge Representation, Concept Maps, Meaningful Learning, Text Visualization.*

1. Introduction

The concept of meaningful learning [1] was established in 1960 by David Asubel. The main principle of this concept is based on the incremental process of learning – before learning of new knowledge learner realizes what he or she knows and after that connects new knowledge to an existing knowledge structure.

Creating concept maps as one form of knowledge representation is useful approach of meaningful learning. Non-automatic making of concept map is relatively slow process and now there is no algorithm for automatic producing of concept map from non-structured data which could work succesfully without many limitations [6]. In this article we describe experiences with suggested model of text visualization, which can be useful as preprocessing of making concept maps. Our experiences are shown in examples of meaningful learning process.

2. Meaningful learning

2.1 Concept of meaningful learning

Learning as a process can be divided into two types [1]. First it is a discovery learning that is used every time when learner identifies concepts autonomously. Second type is a reception learnig when concepts are described to learner using a language, into they are transferred. In both types we speak about learning of new concepts. You can learn new concept by your own discovery or by reception from another people. The question is do we integrate this new concept with our existing knowledge?

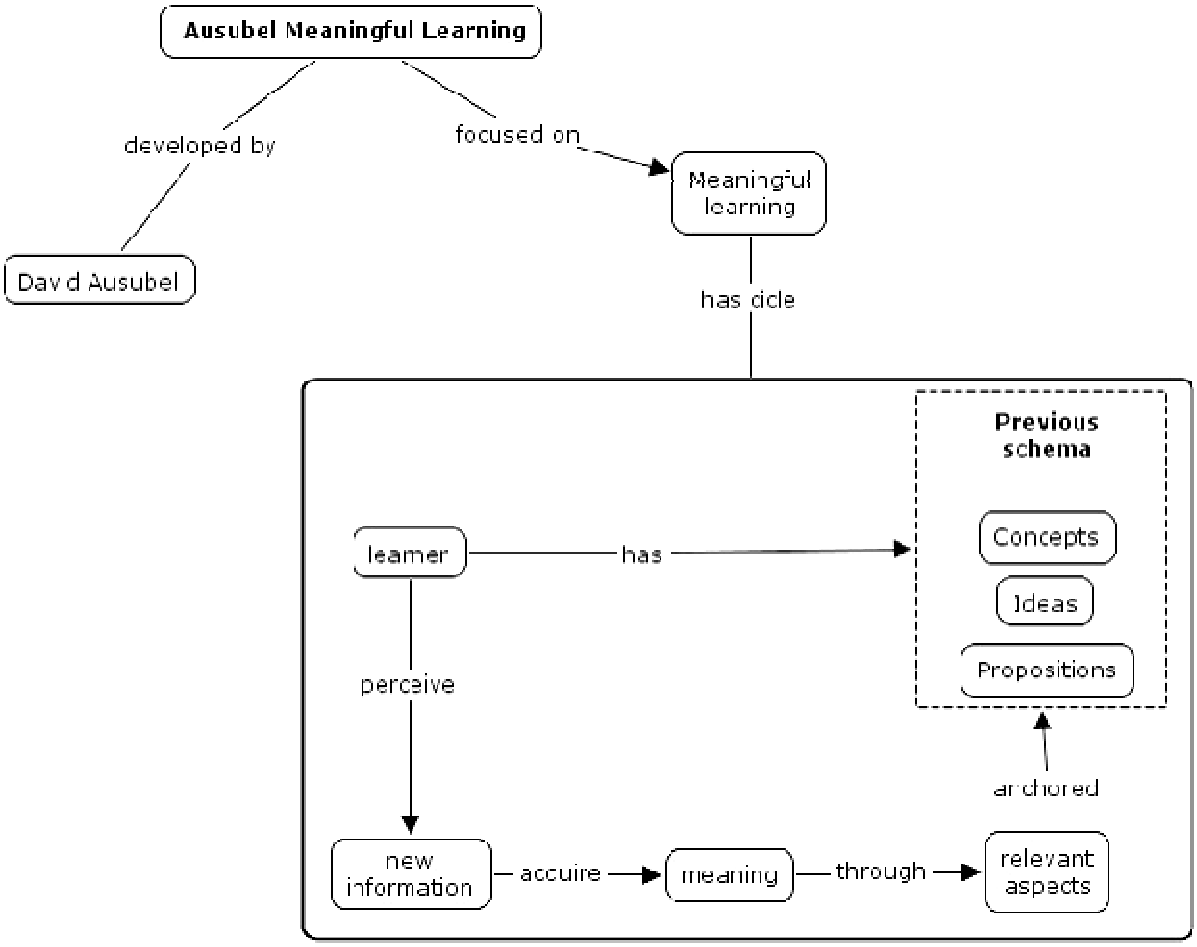
For this purpose we can distinct between rote learning and meaningful learning [1]. Rote learning is defined "*as arbitrary, non-substantive storage of knowledge in cognitive structure without the effort to integrate it with previously learned knowledge*" [2]. This can be seen in school assessment where students tend to learn by rote. On the opposite site meaningful learning requires integrating new knowledge with existing knowledge. To understand meaningful learning we have to realize that learner has to choose to learn meaningfully. It is the necessary condition. One of the effective ways of meaningful learning is the creativity.

Ausubel (1960) believed that meaningful learning involves personal recognition of the links between concepts [10]. The most important element of meaningful learning is not so much how it is presented but how new information is integrated into an existing knowledge base.

A major instructional mechanism proposed by Ausubel is the use of advance organizers. The advanced organizer approach to teaching became a cognitive instructional strategy used to promote the learning of new information. This approach encourages students to build upon prior knowledge and mentally organize their thoughts before being introduced to the details of new concepts. In another word, before learning something new, realize what you know. Understand your own concepts to be prepared to incorporate new one [10].

Ausubel emphasizes that advance organizers are different from overviews and summaries, which simply emphasize key ideas and are presented at the same level of abstraction and generality as the rest of the material. Organizers act we can imagine as a subsuming bridge between new learning material and existing related ideas. The most general ideas of a subject should be presented first and then progressively differentiated in terms of detail and specificity [10].

Picture No.1 shows Ausubel theory as summarized by students.

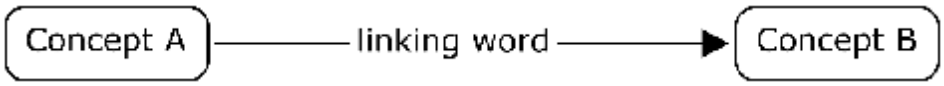


Picture No. 3: Ausubel theory (http://cmc.ihmc.us/cmc2006Papers/cmc2006-p152.pdf)

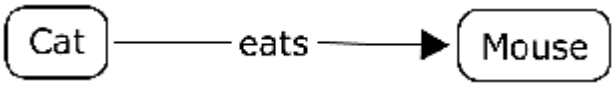
2.2 Concept map

Concept maps (cmaps) are graphical tools for organizing and representing knowledge. Basic element of cmaps is concept. Novak defined concept [9] as "*a perceived regularity (or*

pattern) in events or objects, or records of events or objects, designated by label". By joining concepts together with appropriate linking words we made a statements or propositions. The propositions are building blocks for knowledge.



Picture No. 2: Basic type of proposition (source: authors)



Picture No. 3: Example of proposition (source: authors)

Concept maps include concepts, usually enclosed in circles or boxes, and relationships between concepts indicated by a connecting line linking two or more concepts. Words on the line, referred to as linking words or linking phrases, specify the relationship between the concepts [9].

The label for most concepts is a word, although sometimes we use symbols such as + or %, and sometimes more than one word is used. Two or more concepts connected using linking phrases to form a meaningful statement are known as proposition. The definition of propositions [9] can be: *"Propositions* are *statements about some object or event in the universe, either naturally occurring or constructed."* Popositions are also called semantic units, or units of meaning [3].

In this part we explain concept of meaningful and rote learning using the text visualization.

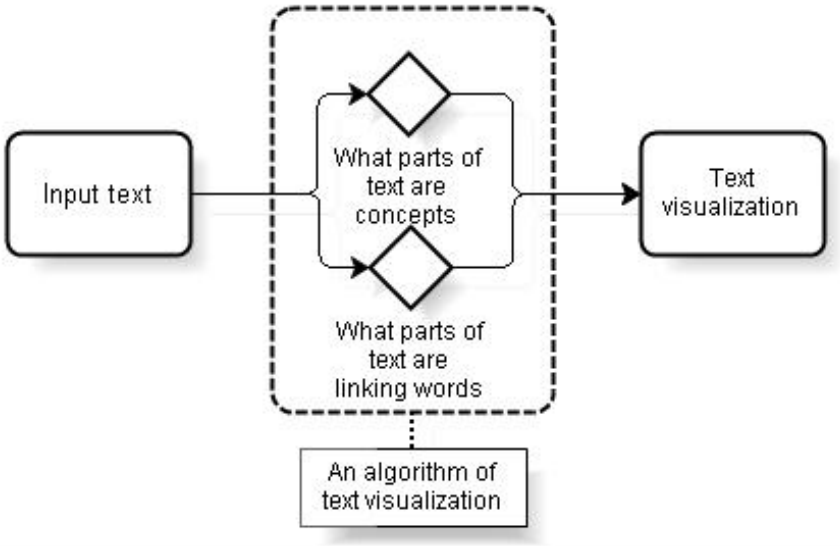
3. Text visualization

The human perceptual system is highly attuned to images, and visual representations can communicate some kinds of information more rapidly and effectively than text [7]. We suggested the model for text visualization, which produces "near-concept-map" visualization of text. This structure looks like concept map, but it is only "near-concept-map" visualization, because in real concept maps there are links among concepts which are constructed according to logical relationships contrary of suggested text visualization where the links are constructed according to sequence of the words in the text you visualize.

Automatic constructing of concept map from text is very difficult issue. Currently there is no algorithm, which can solve this problem without big limitations. Algorithms, which can approximately solve this problem, are often algorithms of artificial intelligence [6].

3.1 Text visualization with using the Czech National Corpus

Suggested model of text visualization is based on finding concepts and linking words in text. Output of this "near-concept-map" visualization can be used as preprocessing of creating a real concept map. The process of text visualization is described on picture No. 4.



Picture No. 4: Process of text visualization (source: authors)

The suggested model of text visualization (it is described in part 3.2) generates "near-concept-map" by using the Czech National Corpus [4]. The Czech National Corpus (CNC) is an academic project focusing on building a large electronic corpus of mainly written Czech. A Corpus is a collection of texts in electronic form, used for linguistic research. Today it contains about 300 million words. A special search engine facilitates work with this corpus. It also enables further processing of the found data (alphabetical classification, etc.). This search engine also enables finding words according to parts of speech [11].

3.1.1 Classification of linking words by using the CNC

Every scientist, who is registered to the CNC, can do many operations with outputs of corpus by using program Bonito (which is free for download). Between main operations, useful for classification of linking words, belongs finding words according to parts of speech.

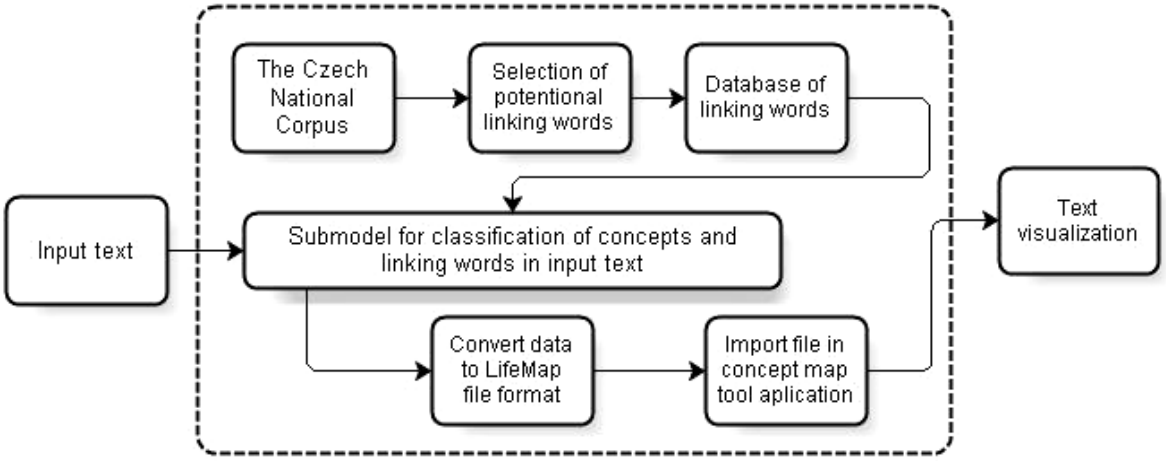
Traditional grammar classifies words based on eight parts of speech: the verb, the noun, the pronoun, the adjective, the adverb, the preposition, the conjunction and the interjection. The CNC uses special expressions (tags) for finding words according specification you need. For example: **[tag="P.*"]**, where "P" is for finding all words in corpus which are the pronoun. Searching words according to the parts of speech is very simple and fast. Output of searching can be exported to the external file for another process [5].

3.2 The model of text visualization

The suggested model of text visualization use for classification of linking words four parts of speech (the conjunction, the preposition, the verb and the pronoun) and some selected words. So the other words in text (mainly the noun) are automatically classified as concepts. The model for text visualization generates "near-concept-map" by using classification submodel and concept map application (concretely was used freeware utility: CmapTools).

Submodel for classification of concepts and linking words was created as a number of linked spreadsheets in Microsoft Excel. The spreadsheets contain classification algorithm and database of linking words created by searching in the Czech National Corpus. The first spreadsheet contains cell for input text, which you want to convert to structured data importable to concept map application. As output format, which can be easy importable to

CmapTool application, was selected LifeMap file format. The last speadsheet contains output structure of converted data, which can be copy and paste to blank **txt.** file and then imported to CmapTool application. Picture No. 5 describes process of text visualization.



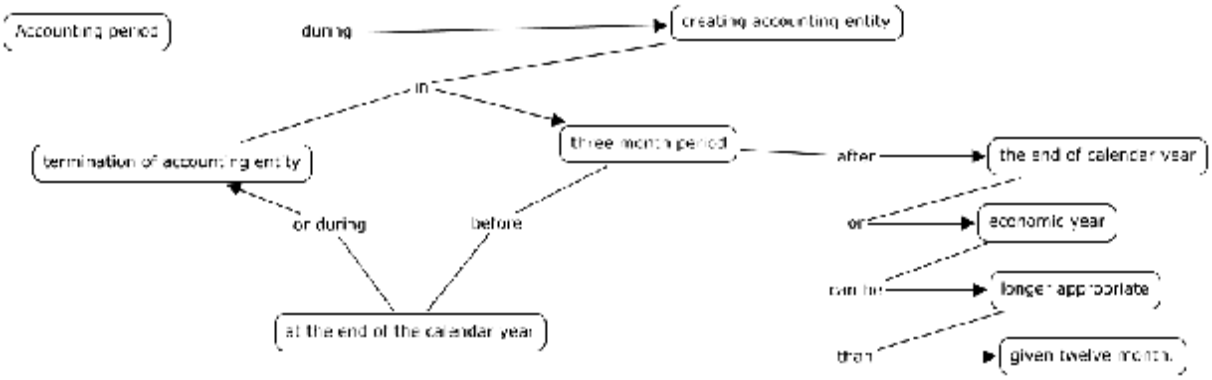
Picture No. 5: The model of text visualization (source: authors)

3.2.1 Experiences of automatic generating "near-concept-map"

The model of text visualization was tested on forty sentences, which was randomly selected from the text of Law of accounting. Our experiences show that the model has some limitations. The first limitation is that you can convert at once only one sentence. This is because of the design of algorithm. This limitation could be take out in a near future and isn't so limitative because you can copy more outputs from Excel to one txt-file.

The other limitation results from the complexity of the language. The Czech National Corpus naturally contains only words, which are not rare in the Czech language. So there is a possibility of unsuccessful classification of rare linking words. When we generated "near-concept-map" from relatively long sentence, then we obtained structure which is not so understandable – see picture No. 6. On the other hand we obtained the good results when we use more simple sentences – see part 3.3. The input sentences in all examples were selected from the Law of accounting.

Input sentence: *„Accounting period during creating accounting entity in three month period before at the end of the calendar year or during termination of accounting entity in three month period after the end of calendar year or economic year can be longer appropriate than given twelve month."* (English translation from the Czech Law of accounting) [8] Visualization of input sentence is on picture No. 6.



Picture No. 6: Automatically generated text visualization of relative long sentence, English translation (source: authors)

3.3 Example of meaningful and rote learning by using text visualization

Rote learning

Disadvantages of rote learning is based on the fact, that knowledge learned by rote learning tends to be quickly forgotten and the cognitive structure of the learner is not enhanced or modified to clear up faulty ideas [9]. Advantage of rote learning is based on the fact, that it's very fast.

Points describe process of rote learning:

1) Learner reads sentence No.1 and 2.
   Sentence No.1:

   „Accounting period either matches with calendar year or is an economic year.“ [8] (English translation from the Czech Law of accounting)
   Sentence No.2:

   „Economic year is an accounting period which can start only first day of another month than January.“[8] (English translation from the Czech Law of accounting)

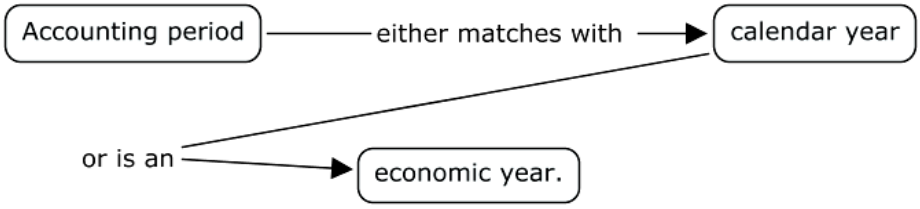
2) Learner has not-organized knowledge (there is uncertainty whether the learner understands the meaning of text)

Meaningful learning

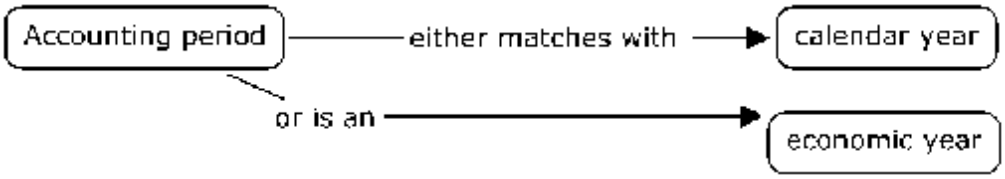
Meaningful learning costs more time than rote learning, but it produces well organized and relevant knowledge structures. It consists in organizers act, which we can imagine as a subsuming bridge between new learning material and existing related ideas [9]. Next points describe process of meaningful learning:

1) Learner reads sentence No.1 and he or she visualizes the "near-concept-map"of this sentence (see picture No.7). This "near-concept-map" he or she manually modifies to concept map according to logical structure of relationships between concepts (see picture No.8). <u>This operation helps to realize what the learner knows about relations between concepts.</u>
   Sentence No.1:

   „Accounting period either matches with calendar year or is an economic year.“ [8] (English translation from the Czech Law of accounting)



Picture No. 7: Automatically generated text visualization of sentence No. 1, English translation (source: authors)

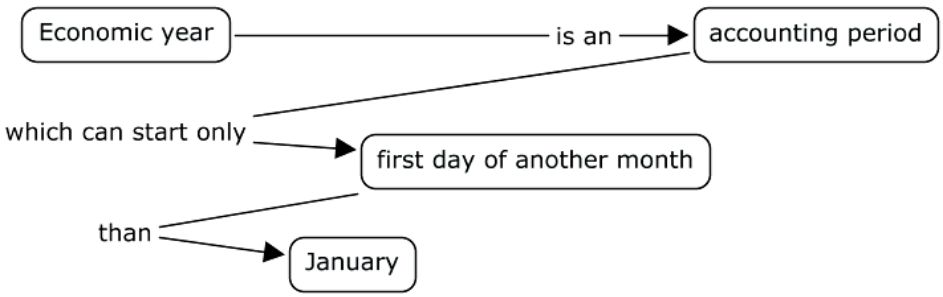


Picture No. 8: Manual modification of text visualization of sentence No. 1, English translation (source: authors)

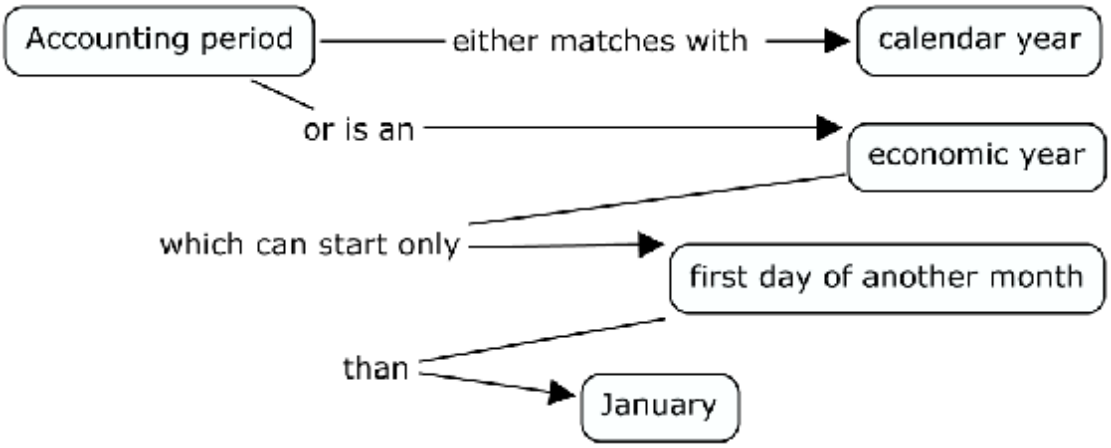
2) Learner reads sentence No.2 and he or she visualizes the "near-concept-map"of this sentence (see picture No.9). This "near-concept-map" he or she manually modifies to concept map according to logical structure. Next step is to incorporate this new "near-concept-map" of sentence No.2 into an existing knowledge structure of sentence No.1 (see picture No.10).

Sentence No.2:

„Economic year is an accounting period which can start only first day of another month than January.“[8] (English translation from Czech Law of accounting)



Picture No. 9: Automatically generated text visualization of sentence No. 2, English translation (source: authors)



Picture No. 10: Manual modification of text visualization of sentence No. 1 and No. 2, English translation (source: authors)

4. Conclusion

We discuss the concept of meaningful learning in contrary of rote learning. It shows examples of both types of learnings using suggested model of text visualization.

Concept of meaningful learning produce well organized knowledges than rote learning. It is based on an incremental principle of learning – before learning of new knowledge learner realize what he or she knows and then connects new knowledge to an existing cognitive structure.

The suggested method of text visualization brings a new approach to the text visualization by combining possibilities of database of electronic texts (the Czech National Corpus) and concept map tool applications. The model of text visualization was successfully tested on forty randomly selected sentences from Law of accounting. Both the suggested model of text visualization and CmapTool application appears as a useful aid for meaningful learning.

Acknowledgement

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LEGAL ASPECTS OF EVENTS OF FEBRUARY 1948

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Abstract: *This paper summarizes the political and legal situation in 1948. It includes basic overview of development in previous years and focuses on the problem of legality of selected problems of the Communist overtook of power. These problems are especially: the appointing of ministers by presidents, importance (or unimportance) of number of resigning ministers and irresponsibility of president for his acting*

Keywords: *Communism, Constitutional Law, February 1948, Legality, National Front.*

1. Introduction

Lot of papers and books were already written about the Communist overtook of the power in 1948; many of them are the memoirs of direct participants. Nevertheless, just few of them focused on the legal aspect of this problem – on the first place I want to mention the articles of Václav Pavlíček written in 1967 and 1968 and presented in his book on freedom and democracy [PAVLÍČEK 2005]: *February 1948 in Parliament, Political Parties and Socialism* and *February 1948 – some notes on the February events in Czechoslovakia*. The consequences are preciously summarized in many parts of the latest monograph dealing with the topic of Communist law. [BOBEK, MOLEK, ŠIMÍČEK 2009]

This article is targeted to give an overview of the events of February 1948 from the legal point and is concentrated on the acting of constitutional functionaries by this time. The article has to answer the question of legality of the constitutional procedures which resulted to the power overtook realized by Communists after the demission of ministries of democratic parties.

2. Political situation 1945-1948

2.1 Starting points

The main event which influenced the next development of Czechoslovak state and society was the 1946 election. The Communist Party won this election having gained 114 of 300 chairs in the National Assembly.[1]

But it is a mistake to think that the policy line of the state was given by the results of this election. Much more important were the negotiations between the Czechoslovak exile government and Soviet Union about the strategic orientation of Czechoslovakia during the World War II. Act which confirmed the process of convergence with USSR was the Government program of Košice assumed in April 1945. [BOBEK, MOLEK, ŠIMÍČEK 2009]

[1] Election in 1946 ended by the victory of Communist party. There were 114 Communist MPs, 55 National Socialist MPs, 46 Popular Party MPs, 46 Slovac Democratic MPs, 39 Social Democratic MPs and 3 Freedom Party MPs. The victory strengthens the position of Communist Party in the international communist movement too. [PAVLÍČEK 2005]

Next important point was complete reconstruction of the system of political parties. The situation in Czech lands was influenced by the position of the political representatives in exile, in Slovakia it was given by the results of the Slovak National Rising 1944. All politicians including president Beneš linked their conception of new political system with criticism of pre-war parlamentarism. "Prezident Beneš prosazoval v řadě svých projevů v Londýně systém dvou nebo ještě lépe tří stran – levice, středu a pravice. Předpokládal, že v levicové straně by splynuly Komunistická strana Československa, sociální demokracie a národní socialisté a že komunisté by se v této mase rozplynuli. (…) Střed měli představovat lidovci a konzervativní složku agrárníci." [PAVLÍČEK 2005]

Even conception of the Communist party (creation of united Socialist Party and cooperating Popular Party) was not completely realized. The basic phenomenon which the parties were agreed on was the abolition of opposition and governmental cooperation of all approved parties in the platform of National Front. These parties were the Communist Party, National Socialist Party, Social Democracy and Popular Party in Czech lands, Democratic Party and Communist Party in Slovakia (Labour Party and Freedom Party were marginal).

After the election two competing political blocks took shape. Right-wing (or democratic) block led by the National Socialists (including Popular Party, Slovak Democrats and part of Social Democracy) and left-wing block led by Communists. Communist Party laid out a target to gain absolute majority in the next election (1948) shortly after the election 1946. Already that time the Communists were accused by other parties of effort to install a dictatorship.

2.2 Rising conflict

Preparations for new election culminated during Fall 1947 especially in relation to Congress of Social Democracy (November 1947) and the meeting of the Central Committee of Communist Party in the same time. Communist chairman Klement Gottwald spoke about the necessity of gaining support of majority, danger of possibility of reactionary putsch and about the preparation for election in all ways. [GOTTWALD 1958] But we cannot understand the term "preparation for election" in the same meaning as in tradition democratic societies. As narrates eyewitness of this period, journalist Karel Pacner: "Velkou roli mělo sehrát zastrašování v předvolební kampani. Začátkem ledna 1948 vydal komunistický velitel Sboru národní bezpečnosti rozkaz: V zájmu veřejné bezpečnosti a pořádku je třeba, aby na každé veřejné schůzi byl přítomen aspoň jeden člen SNB, a to v občanském oděvu jako posluchač. Je velmi prospěšné, když se postaví nebo si sedne vedle spolehlivého občana. Pronese-li někdo na schůzi trestní výrok, přihlásí se pak spolehlivý občan o slovo a napadne trestný obsah řeči. Poněvadž zde jde o verbální delikt, je zapotřebí si závadný výrok do slova poznamenati a pak uvést v udání. Jak člen SNB, tak i spolehlivý občan na schůzi přítomný vystoupí pak před soudem jako svědci." [PACNER 1997]

Pavlíček gives us the testimony about infiltration of communists into other parties and about possibility of creation of united left-wing candidacy slate: "Podpora levice v nekomunistických stranách měla případně i vyústit v koncepci vytvoření levicové kandidátky ve volbách, která by zahrnovala všechny pokrokové a demokratické síly a šla za rámec komunistické strany. V zájmu realizace této politiky byla zejména v sociální demokracii a v národně socialistické straně podporována frakční činnost a připravována půda pro takovou kandidátku," and he supplements that the question of power had to be decided. [PAVLÍČEK 2005]

3. February 1948

3.1 Escalation of crisis

Launching moment of the conflict became a disposal of land commander of Police (SNB) lieutenant-colonel Dybal. He called out eight non-communist local commanders in Prague 12th February 1948. This situation was discussed in the government next day and the democratic representatives protested against this proceeding, especially Minister of Justice Prokop Drtina who said: "Dověděl jsem se, že na ministerstvu vnitra byl včera vydán rozkaz zemského velitele SNB pplk. Dybala, podle něhož má dojít ke změně na osmi velitelských místech obvodních velitelů SNB v Praze. Také na některých velitelstvích mají být uskutečněny změny. Při tom se mají na místa dostat vesměs příslušníci KS, ale naproti tomu se odstraňují a odcházejí důstojníci SNB vyšších hodností a s delší služební dobou, kteří mají výbornou kvalifikaci, a opomíjejí se tímto způsobem ve prospěch mladších a méně kvalifikovaných kolegů jen proto, že jde o členy komunistické strany. Tato opatření byla zřejmě učiněna právě v předvečer dnešního jednání vlády a musí tedy vyvolati nejen rozruch a nedůvěru v kruzích nekomunistických členů národní bezpečnosti, ale také nejhlubší nedůvěru členů vlády ostatních politických stran."

The government agreed with his arguments and accepted a resolution to stop moving the SNB officers and investigate complaints on Interior and Justice. Communists didn't agree with that. [PACNER 1997]

Communist minister of Inferior Václav Nosek refused to fulfill the governmental resolution: he said this matter is not in the competence of government.[2] Democratic ministers demitted in protest against his practice and hoped in fall of whole government and defeat of Communists in election.

Next advancement depends on president. He wasn't delighted with the demission and his first reaction was not to accept it. Communist Prime Minister Gottwald was against that and forced him to accept the resignation. [KAPLAN 1997] According to testimony of president's chancellor Jaromír Smutný Beneš didn't intend to accept the demission and planned the continuation of the government in current composition till early election. But Gottwald pressured on him enormously to accept and nominate new ministers offered by Communists; the representatives of democratic parties didn't expect this evolution [SMUTNÝ 1996].

Anyway, the upcoming pressure existed in whole society on all levels. Movements of Soviet Army in Ukraine, Hungary and Germany and visit of Soviet diplomat Valerian Zorin also couldn't calm down the situation.

[2] Nosek requested to make a legal analysis of the jurisdiction of the cabinet in this matter. One of the experts mentioned the resolution had been only formally incorrect – according to the Constitution the Government had had to declare the question as a political and decide about it. Author of the expertise advised of fact that democratic (non-communist) ministers had the majority in government and they can (even repetitively) recall the procedures advantageous for the Communist Party. [PACNER 1997]

3.2 Legal point of view

3.2.1 Appointing of ministers by the president

Let's concentrate on the legal aspect of incurred situation. Pavlíček says that both parties emphasized the necessity to solve the crisis in legal and constitutional way. [PAVLÍČEK 2005]

Valid 1920 Constitution that prime minister and other ministers are appointed by the president (§ 70). Government shall be responsible to the National Assembly which may express no confidence to it by the majority of votes (§ 75). Pavlíček thinks that the easiest and most logical way to recall the government would be this way. "Byl by to zároveň postup i podle § 78 ústavy, podle něhož vyslovila-li poslanecká sněmovna vládě nedůvěru (…) musela vláda podat demisi do rukou prezidenta republiky (…). O možnosti využití parlamentu však nenacházíme v dokumentech těchto stran žádné zmínky, lze se domnívat, že na parlament a postup podle těchto ustanovení ústavy v celém průběhu krize pravicové strany ani nepomyslely." [PAVLÍČEK 2005] The democratic parties trusted in the cooperation with president and fall of whole government.

The question is what the legal possibilities of president Beneš were. Traditional legal science of the First republic acknowledges broad competences to the president: "Pokud se propouštění vlády týče, nutno zdůraznit, že president republiky je jest státoprávně také zde vlastním subjektem tohoto práva a že mu patří volná iniciativa. President by nemusil vyčkávati žádosti o demisi, kdyby chtěl vládu, či jednotlivé její členy propustiti. Nepotřebuje k tomu také předcházejícího návrhu vlády nebo jejího předsedy." [SVOBODA 1934] Pavlíček didn't agree with this statement by accentuation of the principle of parliamentary democracy and reports to the proposal of 1920 Constitution. [PAVLÍČEK 2005]

In my opinion argumentation of Václav Pavlíček is more logical and systematical than the opinions of the opposite side. Therefore the president had no power to repeal the government without no-confidence vote in Parliament against it.

3.2.2 Number of ministers demitted

Other discussed problem is the importance of fact that only minority of ministers resigned. Common opinion is that after demission of majority the government should no more exist.[3] This opinion is based on § 80 of the Constitution (resp. on § 4 of President's Decree No. 1/1945 Coll. on New organization of government): the Government have a quorum by presence of the majority of members. Pavlíček objects: "V uvedeném ustanovení se uvádí, že vláda rozhoduje ve sboru, který je schopen se usnášet, je-li přítomna nadpoloviční většina členů vlády. Neschopnost vlády usnášet se neznamená nutně povinnost vlády podati demisi, ale toliko povinnost předsedy vlády zabezpečit znovu její dělnost a udržet si důvěru v parlamentu, tak, jak to ústava vyžadovala." [PAVLÍČEK 2005]

Proof of this interpretation is the fact that in the moment when president was appointing new ministers majority of ministers demitted (Social Democrats Václav Majer and and František Tymeš resigned).[4]

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[3] E. g.: "Twelve ministers left but fourteen stayed; therefore the Government had the quorum. By demission of one more minister the Government exists no more. In this situation the Communist Party had the advantage: Gottwald understood it at once." [PACNER 1997]

[4] Compare the opinion of Karel Pacner. [PACNER 1997]

3.2.3 Non-responsibility of president

Third key point of this constitutional problem is the non-responsibility of president from the execution of his office. According to Constitution the government was responsible for his acts; all president's act should be countersigned by prime minister or responsible minister (§ 66). Constitutional customs demanded to sign the repeal of prime minister leaving his office by himself and appointive decree by the new prime minister. [WEYR 1937]

Therefore it wasn't possible to repeal the prime minister without his consent. "Takový prezidentův akt nemohl být platný bez spolupodpisu předsedy vlády, z čehož by vyplývalo, že prezident nemohl platně propustit premiéra neporaženého v Národním shromáždění proti jeho vůli z jeho úřadu, aniž by porušil ústavu." [PAVLÍČEK 2005] Opposite argumentation is used (again) by some of pre-war constitutionalists: "… by nebylo překážek, aby i propuštění staré vlády bylo spolupodepsáno premiérem novým. President republiky je subjektem těchto úkonů a účelem kontrasignace není, aby mu ji znemožňovala, ale jen aby konstruovala odpovědnost za tyto akty. Dovede-li si president opatřit kohokoliv, kdo svojí odpovědností za jeho akty – změny vlády nevyjímaje – před parlamentem obstojí, nemůže mu být bráněno, aby ji předsevzal." [SVOBODA 1934] This argumentation is problematic related to the democratic legitimacy of such conduct.

4. Conclusion

That's about the formal constitutional procedures applied by the solution of this crisis which reached to the Communist putsch: the proceeding of demission of the democratic ministers and of appointing new government members loyal to the Communists didn't break the constitution. The restoration of government passed in accordance with law.

But all non-legal ways to gain all the power has to be mentioned too. Creation of action committees on all levels, rearming of Popular Militia, stopping of publishing non-communist press and unreasonable seizures of democratic politicians were very significant non-legal actions of the Communist Party in this time. Main importance has the "restored" National Front with participation of representatives of many interest organizations (Labour Unions, Agrarian Union, partisans etc.) and turn-coats from Popular and National Socialist Party. Communist party and Social Democratic Party sent their official representatives. This new National Front was under the full control of Communists and was an instrument to realize the policy of the Central Committee of KSČ. [RIPKA 1995]

By staying on the formal point of view, we can see also one other legal possibility how to solve this governmental crisis. First option was the new parliamentary election, solution planned by the democratic parties, which expected not-acceptation of the demission by president Beneš and fall of the common government of National Front.

Neither Communists nor democratic parties tried to use the solution within the jurisdiction of Parliament. E.g. the democratic parties might try the process of summoning of the National Assembly and no-confidence vote (according to § 76 of the Constitution). Question is the chance to realize this process because the majority in the National Assembly was very uncertain. But from the confidence voting for the new Gottwald's government we can assume that this process will not have a chance and Communists could be more successful trying to decide the battle on the field of Parliament, especially because of many turn-coats from National Socialists, Popular Party and mainly Social Democrats which also gave information to Communists during the whole time of the crisis. [PACNER 1997, RIPKA 1995]

Wednesday 10th March 1948 came the "reborn" government to the Parliament. 241 MPs were present, 9 (reportedly) on holidays, 6 had resigned and 44 were hiding or run off to western countries (of 300 MPs). Till next day (day of the confidence vote) another 11 MPs missed. The voting was unanimous. Communist politician Václav Kopecký later said: "Z obavy, aby jednomyslnost při hlasování v Národním shormáždění nebudila dojem vynuceného zglajchšaltování, přímo jsme prosili některé poslance, o kterých jsme věděli, že s námi ve své duši nesouhlasí, aby hlasovali proti, anebo se aspoň zdrželi hlasování. Ujišťovali jsme je, že se jim nic nestane a nabízeli jsme jim různé záruky. Ale nebylo to nic platné. Hlasovali jednomyslně pro…" [PACNER 1997] Through this voting Communists legalized their overtook of power in Parliament.

Nevertheless, communists gained the real power in the country during the first days of the crisis. They needed the signature of president Beneš only to confirm they victory, formally achieved in democratic way. [KAPLAN 1997, PACNER 1997]

Summarized: Enthroning of Communist power on the constitutional level passed in compliance with Constitution even though acting realized by Communists and Security forces controlled by them during were explicitly contrary to law. Therefore it was in logical antagonism with the Marxist theory of Violent Revolution as explained by Lenin in The State and Revolution, [LENIN 1950] but political processes and other unrightfully actions of Communists in following years could be much more understand as Violent Revolution than the February 1948 putsch. And we can also assume that the Communist party would probably have used the force if the constitutional way of overtook hadn't worked.

I think this analysis fulfill the objective of this paper. Final summarization is that the Communist overtook was (at least from the formal point of view) legal but considering the circumstances we cannot regard it as legitimate and therefore it was against the legal system in general [PŘIBÁŇ 1997] and has to be considered as unlawful.

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PREVENTION OF DRUG ABUSE IN DUTCH-SPEAKING COUNTRIES OF EUROPE – IN THE NETHERLANDS AND THE FLEMISH PART OF BELGIUM

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Abstract:*This article is focused on prevention of drug abuse in Dutch-speaking countries of Europe, the Flemish part of Belgium and the Netherlands. It is based on the information and knowledge that I gained last year during my intership at the Ghent University in the Dutch-speaking part of Belgium and also from the study of literary sources. In this article, I would like to introduce the system of prevention of drug abuse in these countries and describe the individual types of prevention together with some concrete preventive activities and organisations involved in prevention programmes.*

Keywords: *Primary Prevention, Drug Abuse, Preventive Activities, Organizations.*

1. Introduction

In this article, I would like to introduce the basic principles of prevention of drug abuse in the Flemish part of Belgium and the Netherlands. Last year, I passed intership at the Gent University, in the Dutch-speaking part of Belgium; therefore, my information is based especially on this experience and on the study of Dutchwriting authors. In the field of drug prevention, the Flemish part of Belgium and the Netherlands have great influence on each other, because of the language proximity.

The topic covered by this article was marginally mentioned in Pavla Lejčková´s article (2005) in the journal Adictology. She mentions there some web pages of European countries concerning prevention of drug abuse in these countries. Among the others there are also the web pages of Belgium and the Netherlands. Furthermore, we can find some information about drug situation in Europe, so also in Belgium and the Netherlands, is in Robert Macháň´s bachelor thesis (he is writing about drug legislation in European countries) or Lucie Schafferová (she is writing about drug abuse in European countries). On the web pages of the National monitoring centre for drugs and drug addiction (www.drogy-info.cz), it is possible to search out and also download publications about these countries, for example the Annual reports on drug situation in Europe or the National reports on drugs from these countries, which is also possible to borrow from the local library.

2. Belgium

The prevention policy is under the responsibility of the so-called "Community Government", thus, not the Federal Government. The most important official bodies that coordinate prevention policy in the Flemish Community is the VAD organisation (Vereiniging voor Alkohol- en andere Drugproblemen), which cooperates very closely with the government. One of the major organisations in Flanders which is focused on the concrete preventive work in practice is De Sleutel. De Sleutel also works on the international level (EMCDDA - Belgium, 2008).

Evaluation is seen as a very important aspect of drug prevention in Belgium. There was a registration programme created in the Flemish Community in 1996 called "Ginger", which monitors most of the prevention activities in Flanders (EMCDDA, Belgium, 2008).

2.1 Classification and notions of drug prevention

The traditional division of preventive activitites into three main groups is the same in Belgium as in other countries: primary, secondary and tertiary prevention (Kreeft, 2005).

In recent years, there is a new terminology based on Mrazek and Haggerty (1994; in Kreeft, 2005):

- universal prevention (the aim is to reach general population without special risks)
- selective prevention (this prevention is focused on groups of people with higher risks of occurrence of risk behaviour)
- indicated prevention (this is prevention for people with higher risks or people suspected of having some serious problems with drugs)

All these kinds of prevention belong to primary ´prevention´ activities. Instead of 'secondary prevention', the term 'early intervention' is now being used and instead of 'tertiary prevention', we use the term 'rehabilitation' (Van der Stel, 2004).

2.2 Universal prevention

2.2.1 School

Prevention activities in schools are identified in the Federal Drug Policy Note and they are considered to be essential.

The approach in nursery and primary schools is integrated within the framework of health education and health promotion. The most important element is the development of life skills and class- and school-enviroment. Secondary school education is based on the same framework, but it is already focused on more specific activities concerning drug problems .

Drug policy should be set up together with all the involved partners: parents, students, teachers and other school staff, school health service, etc. The methods of evaluating the school drug policy should be established (EMCDDA - Belgium, 2008; Kreeft, 2005).

In the Flemish community, there is a project called Maat in de shit (Friends in troubles), which focuses on children in the age from 14 to 16 years and is dealing mainly with marihuana. The objective is to give information to young people as well as methods of how to help their friends, who have problems with the use of cannabis (EMCDDA – Belgium, 2008).

Another project, which is now being realized in Flanders is a European project 'Unplugged'. The project is lead by De Sleutel. 'Unplugged' is based on the notion of the so-called 'comprehensive social influence programme' and is intended for pupils in the age from 12 to 14. The programme consists of 12 lectures and is tought by a teacher in the period of one school term (Jurystová, Gabrhelík, Miovský, 2009; Faggiano et al. 2008; Kreeft, 2005).

2.2.2 Family

There exist informative publications and brochures focusing on 'parents' as a target group. They offer them advice and tips how they can lower the probability of their children using alcohol and drugs and they inform parents about drugs and drug addiction in general, etc. These brochures are the most frequently produced by VAD.

The organisation Dr Sleutel hold lectures and workshops for parents. There also exist 'Homeparties' organised for parents, when the hostparents invite friends, relatives and neighbours and they talk about problems concerning drugs, and parenting-skills.

There are also plenty of web pages dealing with drug prevention which are focused on parents, children, teachers etc. One of the most often used is ***www.DrugLijn.be***, with loads of information, e.g. how parents can discuss the topic with their children, what they can do to help them and so on (EMCDDA - Belgium, 2008).

2.3 Selective and indicated prevention

One project in this field is developed by the VAD. It is a global prevention programme dealing with out-going and nightlife, which is called 'Partywise'. 'Partywise' tries to teach young people how to party in a safe and healthy way and actually does not deny nor promote the use of illegal drugs in night life. The heart of the project is the web page, where there is possible to find a lot of information concerning nightlife and drug use. Basic information is available also in English and French. One of the parts of this project is a special campaign called 'Partyfriend'. It is focused on group of peers going out. According to the VAD survey, friendship can be an important protective factor as far as drug use on parties is concerned.

The project 'Partywise' also provides direct advice and distributes infromative leaflets at music festivals and dance-parties in Belgium (EMCDDA - Belgium, 2008).

2.3.1 Minoriy groups of inhabitants

Concrete activities for minority inhabitants are organised for example by De Eenmaking in Ghent or Centra voor Alkohol en andere Drugproblemen (CAD) in Limburg or Antwerp. These organisations cooperate with other associations focused on arabic inhabitants, they publish leaflets in their mother languages etc. 'Tuppercare' is avery interesting project . It is a low treshold project focusing on Moroccan and Turkish women. The target group are women that usually cannot be reached and addressed by any other way. Within the social network of these women, one key figure is found who functions like a hostess who invites friends and relatives. In this way it is possible to inform these women about drug-related topics. Sessions are organised in the womens´ own mother language and pay attention to specific values and norms of different cultures(EMCDDA – Belgium, 2008; Boukbir, 2005; Noens, 2008b).

3. The Netherlands

The main document in the Netherlands concerning drug policy is the 'Preventie Note'. It describes main activities in the field of health prevention including prevention of drug abuse. It was published by the Ministery of Health, Welfare and Sports, covers the period of four years (2007-2010) and defines five priorities of prevention: smoking, alcohol abuse, overweight, diabetes and depression. It focuses mainly on young people. Growing attention is receiving by more vulnerable or at-risk groups, e.g. people with mental disability (EMCDDA - Netherlands, 2008; Rigter, 2006).

3.1 Classification and notions of drug prevention

Terms used in the field of drug prevention are the same in the Netherlands as in Belgium.

3.2 Universal prevention

An important official body to coordinate prevention policy in the Netherlands is Trimbos Institute – Netherlands Institute of Mental Health and Addiction. Trimbos Institute cooperate

closely with the Ministry of Health, Welfare and Sports. The ministry also partially funds this organisation. Trimbos Institute organize lot of concrete programmes, for example Healthy School and Drugs programme, which belongs to the oldest school-based drug prevention programmes and is focused mainly on alcohol abuse, smoking and cannabis abuse by children attending primary and secondary schools. One of the new programmes is an Alcohol and Education programme, which is focused on parents and their awareness of the risks of alcohol abuse for their children.

3.3 Selective prevention

There exists a service in some lower vocational schools providing the students that have drug problems with advice in this field. It has a form of an ambulatory clinic, which is established directly at school.

One of the other programmes organized in the Netherlands is The Home Clinic. It is a new type of prevention at home. Anti-drug team can come to the family when contacted by the parents who are suspicious of drug abuse in their family (concerning either children or their partner). The team will teach them how to recognize drug abuse and what is possible to do against it.

The other programme is called The Dutch Strengthening Families Programme and is focused on children of parents or parents themselves with addictive problems. The aim is to improve family atmosphere and to strengthen the family bonds.

The Netherlands is a country with a long experience with immigrants and allochthonous inhabitants. For instance, the programme mentioned above,Tuppercare, originates in the Netherlands. There is also another programme focused on minority inhabitants and that is 'Chebbah' realized in Nijmegen. Young Moroccan boys inform the others about the risks of marihuana use. This programme is based on cultural and peer principle.

Since 1996, the Trimbos Institute is running the National Drugs Information Line (Drugs Info LIjn), which offers objective information, leaflets and counselling service on drugs and drug abuse. Since 2002, they have also a website.

4. Conclusion

This overview article tries to present the course contemporary drug policy in Flanders and the Netherlands and the concrete projects which are realized there. These two countries are of a great influence on each other regarding drug policy and anti-drug activities .

Drug policy is framed in a similar way in both countries: there exist two major organisations cooperationg with government which are also partially funded by government – VAD in Belgium and Trimbos Institute in the Netherlands. Both of these countries use the same terminology, which is also typical for the most of European countries. In both of these countries, the same project Tuppercare takes place. The project originated in the Netherlands and was later adopted by Belgium.

On the other hand, there are plenty of projects which run only in one of these countries, e.g. Chebbah or The Home Clinic etc. However, the amount of influence of both countries on each other is more than evident.

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ANALYSIS OF ENTREPRENEURIAL ENVIRONMENT IN THE SLOVAK REPUBLIC – RESULTS OF A RESEARCH CONDUCTED ON A SELECTED GROUP OF SMALL AND MEDIUM – SIZED ENTERPRISES

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Abstract: *Slovak Republic is a member of the European Union since year 2004. Small and medium enterprises (SMEs) play decisive role in development of its economy, their number exceeding four hundred thousand in year 2008. This paper shows influence of entrepreneurial environment on SMEs after they are facing wide-open united European market space. We have researched factors and results of entrepreneurial activities for year 2008 based upon questionnaires distributed to a sample consisting of 130 SMEs. Results of the analysis were further examined by standard statistical methods.*

Keywords: *Entrepreneurial Environment in the Slovak Republic, Small and Medium Enterprises, Influence of Entrepreneurial Environment.*

1. Introduction

Entrepreneurial environment is very diverse. Literature on the topic recognizes two types of this environment: external and internal. Situation of the external entrepreneurial environment has a decisive influence on entrepreneurship both in the country as a whole as well as in its individual regions.

External entrepreneurial environment is a sum of external factors and conditions, which influence directly or indirectly the formation and development of entrepreneurship. In relation to entrepreneurs, external environment is an objective factor, independent of their requirements. To be successful, entrepreneurs must know very well all factors and conditions, so they can foresee their influences on future results of entrepreneurial actions.

External environment sums up various sub-systems (order below does not reflect importance):

- Economic situation (in country, in region)
- Political situation (in country, in region)
- System forms of support for entrepreneurships by government
- Technological environment, technology and innovation
- Social situation (in country, in region)
- Cultural environment
- Etc.

Entrepreneurial success depends substantially on numerous factors, the most important being internal entrepreneurial environment. It is a summary of internal conditions under which the entrepreneurial subject operates. Internal environment is a composition of resources, which are divided into following categories (Slavik, 2005):

- Tangible assets (material and financial)
- Intangible assets (know-how, trademark)
- Human resources (number of employees, qualification, skills and experiences).

Firms are operating in a real world – in concrete time, space and conditions.

According to subject sector, more than one third of SMEs in Slovakia operate in tertiary sector. In the year 2008 there were 27.82 % companies which operated in trade, 25.61 % in services, 19.72 % in construction, 18.39 % in industrial production and 8.46 % in other activities (agriculture, freelance).

2. Background

Detailed study of both local and international resources devoted to research on SMEs allows defining three major orientations in development of this issue:

The first orientation is formulated by those authors, who approach the issue from *a production organization and efficiency (synergic effect)* point of view (Vebster, L.,2004). As a rule, their works highlights various factors (institutional political, socio-economic), which helps SMEs development. However, there is absence of theoretical models, which would enable to verify number of these and similar factors and empirical control of hypotheses. Therefore, there is a wide spectrum of different definitions and explanations of the entrepreneurial environment. As an example, in her paper the author suggested that the most decisive factor in SMEs development in countries of Central and Western Europe is foreign trade. On the other hand, Berkowitz and Holland, proved based on statistical evidence that SMEs formation has a positive correlation with reform index. (Berkowitz, D. - Holland, J., 2001).

The second group of authors (e.g. Baumol, J.W., 1990) highlights the *SMEs development phenomenon*. They researched importance of entrepreneurship and its specific role in economic development. Baumol implied that entrepreneur is assigned a specific role of an "innovator". If the goal is to increase entrepreneurial activities in under-developed economy, research must be concentrated to find out ways to decrease costs relative to risks. Baumol also opened an issue „how the public influences productivity by rules influencing efficiency of various entrepreneurial activities".

The third group of research papers (Blanchflower, G. D. - Oswald, J. A.,1998) relates entrepreneurship with *theory of usefulness and human's rational behavior on labor market*. In this case, entrepreneurship is a synonym to self-employment and is compared to the alternative of an employee. Blanchflower and Oswald are modeling inclination to entrepreneurial risk and connect it to psychological attributes of a person. They emphasize their attention to young people and to an important parameter – density of capital distribution within society.

3. Main Focus of the Chapter

Questions, discussion, problems

From the time perspective, number of entrepreneurial entities has shown a very dynamic development between years 2003 and 2007. While in the year 2003 number of entrepreneurs exceeded 300 thousand, it was over 400 thousand in the year 2007, which shows a strong growth dynamics in a country with population of 5.4 million. Most of the firms were SMEs – micro-companies with less than 10 employees.

Considering geographical distribution, the highest rate of active entrepreneurs per 1000 population is in Bratislava and its region in southwestern part of the country, the lowest number is in Kosice region in eastern part of Slovakia. It looks as if entrepreneurial activity decreases with increasing distance from capital city to east.

Changes in the entrepreneurial environment and at the same time changes in legislation might influence entrepreneurial conditions. We selected 130 companies for our research, while concentrating to four major groups of problems (questions):

1. How long are these SMEs actively operating, what are their major activities, number of employees
2. Their exports and imports from/to Slovakia
3. Possibilities for SMEs financing in Slovakia – own versus outside resources
4. External and internal barriers in entrepreneurial activities

Re 1. How long are these SMEs actively operating, what are their major activities, what is their number of employees?

During the first two years after Velvet Revolution (years 1990 – 1991) there were 200 thousand starting entrepreneurs. Margin of 300 thousand was not exceeded until year 2003. Selected sample of businesses has a structure similar to the whole Slovakia – 60.9 % of the researched companies have started between years 1990 and 2000; other 27.3 % between 01.01.2001 and 04.30.2004 (that is before Slovakia joined European Union) and 12.1 % of the companies have started their activities after Slovakia became EU member.

It is interesting to see relation between number of employees in a company and perception of the company's economic situation: we have found out that there is indirect dependence between these two parameters within the sample. The fewer employees are in the company, the higher was owners' perception of its „economic strength". It is interesting to observe, that questioned about economic situation after Slovakia entered the EU, only 10.6 % of entrepreneurs claimed that their situation is worse. Half of the entrepreneurs responded that their situation is the same as before and the rest, 39.4 %, claimed that their situation improved.

Re 2. Exports and imports by SMEs from/to Slovakia

After Slovakia joined the EU, internationalization activities in industrial production are stronger than in trade. Only 35.8 % of companies were either exporters or/and importers, mostly to European Union countries – almost two thirds of companies consider this market as the most attractive. It is logical, that mainly large companies execute export/import, for example large shopping stores chains or mechanical construction companies like automotive industry. However, these types of companies were not included in our research, because they together do not represent major part of employment force or a major part of GDP.

There are 64.2 % of companies not involved into export or import, which is a result of various facts: most of the companies started in 1990s and entrepreneurs – their founders – had a very good knowledge about regional markets, but did not know that much about conditions on foreign markets and are not familiar with relevant legislation. Another reasons - indicated in questionnaires as the main ones for not entering foreign markets – are lack of financial resources for marketing, competition of foreign markets, problems in obtaining foreign licenses and certificates. Basically zero export/import is in restaurant services, which buy supplies from local wholesalers. It might be interesting that part of the companies pointed out scarce of qualified human resources, but on the other hand micro-companies did not plan any further hiring. The more employees the company has, the higher was its willingness to hire even more. In their hiring process Slovak SMEs value highest experience and skills, the second rank is education and the third are personal qualities.

Re 3. Possibilities for SMEs financing in Slovakia – own versus outside resources

Based upon research results, we can state that share of outside capital in Slovak companies is increasing. Two thirds of entrepreneurs have experience with outside capital resources during the starting phase of their activities. In our sample, 56.9% of those who responded to the questionnaire started their entrepreneurial activities in Slovakia in year 2008 based upon bank loan, which is a positive sign. It is related to decrease of bank loan rates, because before entering the EU, the decisive financial resources for entrepreneurship were either own savings or loans from family and friends. Own savings as a source for financing SME activity – in our sample – decreased to only 20.7 %, loans from relatives and friends accounted for 5.2 %. Financing obtained thru inheriting or lotteries were quite low, as expected – 3.4 %. Other financial resources accounted for 1.7 %. There is a substantial problem for Slovak entrepreneurs to find and obtain financing from banks, mostly for new entrepreneurs because the problem with securing the loan. In Slovakia, the interest rate is still higher than in West European countries (for example, the neighboring Austria has better credit conditions). On top of that, there is quite a complicated procedure related to all documentation.

Re 4. External and internal barriers to entrepreneurial activities

It is clear that any entrepreneurial activity has its positives and negatives, as well as it has some limits.

The most favorable entrepreneurial situation, indicated by respondents, is based upon following facts:

a) **The market is still not satisfied** (note: during the research, Slovakia was preparing for switch from Slovak Koruna to Euro, so there were products in demand exceeding offers – e.g. new electronic cash registers, new software, special accounting software, etc.)
b) **Social and environmental influences** (obligatory contributions to social fund, means related to environment protection)
c) **Technological environment** (innovations of processes and products, thanks to fast information transfer).

On the other hand, entrepreneurs had their say also tom problems. During the research they have a choice from 28 possibilities to choose from to indicate what they consider as major barriers. From their point of view, following are the **major obstacles entrepreneurs are facing**:

A. Financial problems, mainly in following:

a) Insolvency of customers – in reality, the crisis begun with not enough liquid capital to cover short term debt of customers, which triggered a chain reaction.
b) High Social security insurance - every entrepreneur in Slovakia pays for his/her employees more than one third of levies to Social security insurance, which increases the cost on an employee.
c) Various amendments in calculation of taxes, levies and other charges – there is continual change and amending of all legislation related to taxes, with particular problems with indirect taxes. The Act on VAT influences not only entrepreneurs, but also consumers. Based upon their type, direct taxes are paid to various authorities. Levies are paid to at least two different institutions – to a health insurance company by persons' choice, and to Social Insurance institution. If an entrepreneur has employees, it is his/her duty to subtract employee's health insurance and social insurance from

paycheck and send the employee's portion of insurance contribution directly to insurance institution. However, there are number of various levies, quite often illogical – e.g. membership fees in associations even if the membership is mandatory for specific entrepreneurial activities or occupations (e.g. publishers to Literary foundation).

B. Administrative problems, which can be divided into three categories:

a) Complicated registration – for example there is no "Single Point of Contact" where an entrepreneur can register to all required institutions, but he/she has also visit in person Social Insurance institution and institutions of other authorities (e.g. local/municipal office to register for local taxes, for garbage removal services and other fees).

b) Extensive documentation – small entrepreneur has to have the same accounting and other documentation as a large one, which creates problems for micro-entrepreneurs and SMEs. Most of them have to hire specialist for this agenda, which can be non-efficient in case of small business and small revenues and can lead to loss of profitability.

c) Frequent changes of legislation – changes and amendments of relevant legislation in Slovakia are way too frequent. For example Act 455/1991 on Business Code has been amended ca 20 times since year 1991, which is similar to the case of Act 513/1991 Commercial Code as well as for other legislation. Therefore SMEs are more probable to face large problems than companies with their own legal departments.

C. Other problems, which can be divided into three categories

a) Crime – is related to inadequate protection of ownership rights and with interests of entrepreneurs. Delays in legal processes cause insecurity among citizens, including entrepreneurs. It seems that problem with extortion can not be solved.

b) Controls – there are too many controlling institutions, which distract entrepreneurs from their real entrepreneurial activities.

c) Penalties and fines – some of the penalties and fines are illogical: they have to be paid first and only afterwards appealed. It is mostly a case for payments to large companies – e.g. utility services – which have major market share and quite often their contracts are unfavorable to SMEs.

4. Solutions and Recommendations

Re 1) Cooperation

For such a small country as Slovakia, the number of operating SMEs is sufficient; the problem is more in their efficiency. Therefore it is appropriate to look for various forms of cooperation, so those small isolated entrepreneurships could pool their capital and become efficient.

Cooperation can be:

a) Case by case

b) Short-term

c) Medium-term

d) Long-term.

Cooperation can be working either on horizontal level, or in vertical direction or both. In such a way the risk is diversified, scope of activities can be increased and Slovak companies can be competitive. In general, on a large global market there is potential to succeed only with quality products priced appropriately.

Re 2) Internationalization of SMEs

Slovak market is not a large one, but still interesting for all suppliers. It would be appropriate to turn attention more to export of products and in preparation of contracts to utilize assistance available to entrepreneurs – well-built infrastructure of various entrepreneurial associations and their advisory and consulting capacities. Only 16% of respondents are currently using these services – and it is not enough. One of the reasons of low trust in these institutions has its roots in lack of information – 23.1% of entrepreneurs either did not know about these organizations or they considered them as obsolete.

Re 3) Means of SMEs financing

Slovak SMEs do not use funds from the European Union in an extent they are available. The problem SMEs indicated is complexity of the project they do not have time to prepare or money to put in. Therefore, in financial difficulties they rather turn to banks or their relatives or friends. There is currently a lot of information on Internet regarding possibilities to finance SMEs from various resources and so an opposite situation can happen – that in their effort to get "fast money" from non-banking institutions they might loose even more.

Re 4) Barriers to entrepreneurial activities in Slovakia

A. **Financial problems**, which can be split into three categories:

a) *Insolvency of their customers* – it is crucial to be very careful in preparation of any business relations and contracts.

b) *High level of Social Security Medicare and Health insurances* – the only legal way to decrease high levies in Slovakia is to employ disabled persons, or – instead of full-time employment – either to use contracts or part-time employment. Slovak entrepreneurs mostly use cooperation with subcontractors, who invoice for their work and pay the levies.

c) *Changes in calculation of taxes, levies and other fees* – to limit frequent legislative changes can be probably accomplished only by electing highly qualified legislators – members of the Parliament. It is worth to think about "one point of payment" instead of separate payments to be made various authorities (e.g. property taxes, health insurance, social insurance, etc.)

B. **Administrative problems** are divided in three categories:

a) *Complicated registration* – can be solved by automated information system. However, during current economic crisis such a solution might be unrealistic due to one-time initial investments to information technologies. The other problem might be created by probable decrease in employment of those people whose work will be replaced by AIS.

b) *Extensive documentation* – small entrepreneur should be required to keep only basic business documentation.

c) *Frequent changes of legislation* – changes and amendments of relevant legislation were logical due to legislation approximation with other European Union and Eurozone countries (EU member states using Euro as their currency). It could be foreseen that new generation of experts will ensure more efficient and more stable legislative framework.

C. Other problems divided in three categories:

a) *Crime* – to fight crime means increased interest from both the society as a whole and entrepreneurs in particular. It is inevitable to speed-up trials and court decisions and to fight low law enforcement.
b) *Controls* – should have primarily preventive and educative functions.
c) *Penalties and fines* – speed-up all processes related to appeals

5. Future Research Directions

This research was conducted on a sample of 13o SMEs in Slovakia. Most of the entrepreneurial entities were established before Slovakia joined European Union.

While entrepreneurial base in Slovakia is regionally strong, it is important to build-up its competitiveness outside of the country – and not only towards European Union countries. Cooperation of companies is inevitable – division and specialization in production calls for cooperation.

Economic crisis clearly demonstrated that companies throughout the whole world are interlinked either directly or indirectly via market and banking sector.

It is needed to research in detail cooperation ties among SMEs not only on regional, but also on international level. Communication and cooperation is often missing within various regional and multinational consulting institutions. I advise to re-evaluate cooperation of a large number of institutions that are associating SMEs under different goals, and to re-evaluate efficiency of their activities regarding entrepreneurship development.

6. Conclusion

We have found out some very interesting facts in this research: first of all that most of entrepreneurs are afraid of cooperation. Therefore the cooperation – be it horizontal, vertical or matrix – is moving forward slowly. Micro-companies are domineering in Slovakia. Working with a large team or with cooperative partner is more risky, especially if joint financial resources are in question. Decisive form of entrepreneurship in Slovakia is business (self-employment) in case of physical persons. In spite of all problems indicated, entrepreneurs in Slovakia see the economic situation after joining European Union mostly as positive.

During the recent years Slovakia has the highest GDP growth among all EU countries, amounting to 6 % in the past year. The reason was a good timing for start of reforms. Slovak entrepreneurs are facing problems in obtaining financial capital – specifically from banks. The solution is rational and mutually beneficial cooperation of SMEs, which might bring in capital even during a crisis and so help in increasing competitiveness. Introduction of Euro as a currency and joining the Eurozone helped to stabilize Slovak market. Slovak entrepreneurs proved that they are able to be functional even in hard times. As the economic development and situation in Slovakia shows, barriers are not impassable. Situation on labor market has improved to some extent by lay-offs of qualified workers. If they are flexible, they can help to reinforce other – active - entrepreneurial entities.

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Key Terms & Definitions

Small and Medium Sized Enterprises (SMEs) – about European Commission Recomendation No. 2003/361/EC since 1st January 2005 :

Micro, small and medium-sized enterprises are defined according to their staff headcount and turnover or annual balance-sheet total.

A medium-sized enterprise is defined as an enterprise which employs fewer than 250 persons and whose annual turnover does not exceed EUR 50 million or whose annual balance-sheet total does not exceed EUR 43 million.

A small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.

A microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

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LABOUR MARKET ASPECTS IN VISEGRAD GROUP COUNTRIES

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Abstract: *The presented article deals with labour market institutions and labour market performance in the European Union, especially within Visegrad group countries. A set of institutional aspects such as employment protection legislation, structure of wage bargaining, taxation of labour and the system of unemployment and social benefits determine the institutional framework of labour market. The paper is composed of the comparative analysis of selected criteria and corresponding economic indicators of the EU Member States. The author has chosen the method of comparative analysis as the basic method for accomplishing the goal of the paper - to analyse the labour market institutions and their contribution to labour market performance in the EU Member States. The evidence shows that the labour market flexibility is higher in the Visegrad group countries than average of "old" EU-15 Member states.*

Keywords: *Labour Market, Flexibility, Institutional Aspects, Employment Protection Legislation, Wage Bargaining, Taxation of Labour, Unemployment Benefits.*

1. Introduction

The presented paper deals with the various problems associated with labour market performance in the Czech Republic and other Visegrád group countries (V-4) in comparison with "old" EU Member States. The main goal of the article is to evaluate an institutional framework of V-4 labour markets within. Labour markets in EU new Member States are blamed for insufficient flexibility which stemmed from persisting but still weakening influence of precedent system of central planned economy. This argumentation is supported by the development of main macroeconomic indicators such as high unemployment rate, respectively low employment rate and high share of long term unemployment on overall unemployment. Moreover, after joining the Eurozone new Member State will lose autonomous monetary policy which is perceived as effective instrument of economic policy in case of an asymmetric shock. Then we can ask if any alternative instrument exists. Economic theory defined fiscal policy as one of the main instruments but because of Maastricht ´s fiscal criteria and long-term state-budget deficits in most V-4 countries this instrument will hardly to be used. Then the only possible instrument is labour market flexibility which "*shows how quickly markets adjust to the external shocks and changing macroeconomic conditions."* [1]

2. Institutional aspects of labour market

The labour market is more complicated in general way. In accordance with [3] the labour market is affected by culture, institutional, legislative or political mechanism. Generally, we can find this structure of labour market institutions in theoretical literature:[2] employment protection legislation, structure of wage bargaining, active labour market policies, taxation of labour and unemployment benefits.

[1] Eamets and Masso [11, pp.4]
[2] Borghijs and van Poeck [5]; Buscher et al [7]; Jackman, Layard and Nickell [16].

Most studies are focusing on influence of institutional aspects on unemployment or employment, both in positive or negative direction - (i) some institutional aspects may generate higher unemployment rate; (ii) some institutional aspects may influence the nature of unemployment but have an ambiguous effects on unemployment rate and (iii) some institutional aspects do not influence both the nature of unemployment or unemployment rate.

The analysis of an influence of these aspects may be carried out in two directions: first, we can analyse the degree of labour market regulation, secondly, we can try to find an optimal setting of institutional framework.

Freeman [13] discriminates two approaches to labour market regulation. The first one (institutionalist view) considers these aspects desirable as significant instrument of social protection and they can incite growth of productivity. These aspects can also operate as moderate measures in case of aggregate demand decline. The second one (distortionist view) highlights the benefit of market mechanism and takes it, that these institutional aspects impede the adjustment process in case of economic shocks.

Betcherman et al [3], on the basis of *World Development Report, Workers in an Integrating World, the World Bank* (1995), emphasizes four different reasons for public intervention in the labour market:

- *Uneven market power - workers may find themselves in a weak bargaining position.*
- *Discrimination - workers belonging to groups with little voice or power (e.g., due to age, gender, ethnicity, etc.) may experience particular disadvantages in the labour market.*
- *Insufficient information - workers and some employers may not have adequate information to make informed decisions about the conditions of work.*
- *Inadequate insurance against risk - workers are typically unable to formally insure themselves against labour market-related risks associated, for example, with unemployment, disability, or old age.*

Blanchard and Wolfers [4] pursued how labour market institutions form the impact of shocks on unemployment in two directions. First, they examined aspects influence on the impact of shocks on unemployment. Secondly, the authors examined their influence on the persistence of unemployment. In context of European labour market the authors conclude: *„There is enough heterogeneity in labor market institutions within Europe to potentially explain differences in unemployment rates today. As to the evolution of institutions over time, it is clear that neither the view that labor market institutions have been stable through time, nor the view that the labor market rigidities are a recent development are right.“* [3]

If labour market flexibility may be an instrument of adjustment process in case of an asymmetric shock we matter to define labour market flexibility and its aspects. We can find out pregnant definition of labour market flexibility in Eamets and Masso [11]: *“We can say that labour market flexibility shows how quickly markets adjust to the external shocks and changing macroeconomic conditions.”* Klau and Mittelstadt [17] distinguish four broad aspects of labour market flexibility: (i) real labour cost flexibility at the economy-wide level; (ii) adaptability of relative labour costs across occupations and enterprises; (iii) labour mobility and (iv) flexibility of working time and work schedules. The first two are macro- and

[3] Blanchard and Wolfers [4, p.16]

microeconomic aspects of labour-cost flexibility, while the latter two relate to the quantitative and qualitative adaptability of the supply and use of labour. Some of these elements interact. Eamets and Masso [11] also subdivide flexibility into microeconomic and macroeconomic level. Macroeconomic level can be further divided into institutional flexibility and wage flexibility. The first one represents to what degree the institutions and labour unions are involved in regulation of labour market. The latter one indicates how the wages are sensitive to market fluctuations. Microeconomic flexibility is associated with the labour market flows analysis. The labour market can be characterized by various flows of workers (transitions between labour market states, occupational mobility and geographical mobility) and by jobs flows (job creation and job destruction).

2.1 Employment protection legislation

First observed institutional aspect is employment protection legislation (EPL). We can understand EPL as rules refer to hiring and firing process (e.g. unfair dismissals, termination of employment for economic reasons, severance payments, minimum notice periods, administrative authorization for dismissals, and prior consultations with trade union and/or labour administration representatives).

Betcherman et al [3] consider EPL along a rigidity/flexibility continuum. At the rigid end these regulations are enforced: temporary employment is restricted, hiring standards for employers are in force, employer´s decision on workers dismissal is limited by legislation or by severance, notice, and administrative requirements. At the flexible end liberal concept of EPL is enforced: statutory (or collectively bargained) regulations are minimal and market mechanisms largely determine hiring and firing.

According to Eamets and Masso [11] some of these rules of law were adopted as a “pillow” in case of labour demand decline which can have negative effects on employment while others are designed to protect employees from arbitrary dismissals.

We can find out two parallel view of EPL. The first one supposes that strict EPL can impede effective labour market performance and implicitly the economy. The latter one is based on an opinion that employment will be more stabile and individual contracts long-term if strict EPL exists. In other words – strict EPL reduces hiring and firing and stabilize the flows within labour market.

We can determine the level of strictness of labour market legislation through the use of indexes, which were created by World Bank within the frame of Doing Business Program. The structure of following table is: column ***a*** represents Difficulty of Hiring Index and it means difficulty of hiring a new worker; column ***b*** represents Rigidity of Hours Index and it means restrictions on expanding or contracting the number of working hours; column ***c*** represents Difficulty of Redundancy Index and it means difficulty and expense of dismissing a redundant worker; column ***d*** represents Rigidity of Employment Index and it means an average of the three indices; column ***e*** Redundancy costs (cost of a redundant worker, expressed in weeks of wages).[4]

[4] Methodology is available on http://www.doingbusiness.org/MethodologySurveys/EmployingWorkers.aspx

Tab. 1: Employing Workers (Doing Business 2009 edition)

	a	b	c	d	e
	Difficulty of hiring index (0-100)	Rigidity of hours index (0-100)	Difficulty of redundancy index (0-100)	Rigidity of employment index (0-100)	Redundancy costs (weeks of salary)
Czech Rep.	33	0	0	11	22
Hungary	0	67	0	22	35
Poland	11	33	30	25	13
Slovakia	17	20	30	22	26
EU-15	31,4	40	32	34,4	30,2

Source: World Bank: Doing Business [online][cit.2009/15/09] Accessible from <http://www.doingbusiness.org/CustomQuery/Default.aspx?excel=false>.

Figure 1 compares the valuables of three groups – EU15 and V-4. The conclusions in this section are as follows:

- V-4 countries had lower legislation regulation than EU-15 average;
- EU-15 average employment protection legislation was the higher but considerable differences existed (countries with low level of regulation e.g. Denmark or United Kingdom on the one hand and countries with significant higher degree of regulation e.g. Greece or Spain).

2.2 Structure of wage bargaining

We understand trade union as: „a continuous association of wage earners for the purpose of improving the conditions of their employment". [5]

Trade unions are established on the basic of asymmetry in contracting between individual workers and employers. This inconsonance rises from existence of human and labour rights. Aidt and Tzannatos [1] show both costs arising from existence trade unions and potential benefits. Trade unions play key role in wage bargaining within EU and they have impacts on labour costs. Higher negotiating power of trade unions tends to increase wage level above equilibrium level. Buscher et al [7] argue that this effect could be forced if strict EPL and generous unemployment benefits exist.

Borghijs and van Poeck [5] distinguish three levels of wage negotiations: (i) firm or plant level (decentralised bargaining); (ii) industry level (bargaining at the intermediate level) and (iii) national or country wide level (centralised bargaing).

De Grauwe [14] argues: „...countries with either strong centralization or strong decentralization of wage bargaining are better equipped to face supply shocks, such as oil increase, than countries with an intermediate degree of centralization. In these „extreme" countries there will be a greater wage moderation than in the intermediate countries. As a result, the countries with the extreme centralization or decentralization tend to fare better, in terms of inflation and unemployment, following supply shocks, than the others." [6]

[5] In Checchi and Lucifera [8, pp.5]
[6] De Grauwe [14, pp.16]

This institutional aspect is hard to search because of data´s accessability and their harmonisation from different sources. We made use of [19] and [20]. We add one new partial indicator – coefficient of coverage/density. Following table summarizes main indicators for appraisal of the structure of wage bargaining.

Trade unions ´s negotiating power is a factor which has impacts on rigidity degree of the labour market. This is a result of a fact that unions control wage bargaining effectively not but that they have few members as we can see in a table. Last but one column represents collective bargaining coverage (as percentage). The significant contrast is the situation in France, where only 10 % of workers were members of trade unions but 90 % of workers were covered by collective agreements. The coverage was high also in Scandinavian countries but this was with one difference – these countries were distinguished by high degree of union density which compensated the high coverage. On the other hand both indicators were low in some countries – Anglo-Saxon countries and V-4 countries, where both density and coverage reached low valuables. If we attach these indicators in a fraction (numerator is the coverage and denomination is a density) we get new coefficient (in table this is the last column).

We believe that this coefficient is important factor of overall labour market flexibility. If the coefficient reaches value close to one, then the negotiating power of unions conforms to size of union´s membership. If we look at previous table we can see that values of United Kingdom, Czech Republic, Slovakia or Scandinavian were close to 1. We tried to demonstrate that low unions ´s density does not mean their low negotiating power by definition.

Tab. 2: Wage bargaining indicators

	Centralization[1] 1995 – 2000	Co-ordination[2] 1995 - 2000	Trade Union Density 2000	Collective bargaining coverage (as %) - 2000	Coefficient coverage/density 2000
Belgium	3	4,5	56	90	1,6
Denmark	2	4	74	80	1,08
Finland	5	5	76	90	1,18
France	2	2	10	90	9
Ireland	4	4	38	n.a.	-
Italy	2	4	35	80	2,28
Germany	3	4	25	68	2,72
Netherlands	3	4	23	80	3,43
Portugal	4	4	24	80	3,33
Austria	3	4	37	95	2,56
Spain	3	3	15	80	5,33
Sweden	3	3	79	90	1,13
United Kingdom	1	1	31	30	0,96
Czech Republic	1	1	27	25	0,92
Hungary	1	1	20	30	1,5
Poland	1	1	15	40	2,67
Slovakia	2	2	36	50	1,39

Note:
a) Centralisation:
1 = Company and plant level predominant.
2 = Combination of industry and company/plant level, with an important share of employees covered by company bargains.
3 = Industry-level predominant.
4 = Predominantly industrial bargaining, but also recurrent central-level agreements.
5 = Central-level agreements of overriding importance.
b) Co-ordination:
1 = Fragmented company/plant bargaining, little or no co-ordination by upper-level associations.
2 = Fragmented industry and company-level bargaining, with little or no pattern-setting.
3 = Industry-level bargaining with irregular pattern-setting and moderate co-ordination among major bargaining
actors.
4 = a) informal co-ordination of industry and firm-level bargaining by (multiple) peak associations;
b) co-ordinated bargaining by peak confederations, including government-sponsored negotiations (tripartite agreements, social pacts), or government imposition of wage schedules;
c) regular pattern-setting coupled with high union concentration and/or bargaining co-ordination by large firms.
d) government wage arbitration.
5 = a) informal co-ordination of industry-level bargaining by an encompassing union confederation;
b) co-ordinated bargaining by peak confederations or government imposition of a wage schedule/freeze, with a peace obligation.

Source: OECD [19]; [20]; own calculation

2.3 Taxation of labour

Taxis on employment refer to both sides on labour market – labour supply (labour force pay income taxes) on the one hand and labour demand (employers, who pay payroll taxes) on the other side.

Economists created so-called tax wedge which expresses overall taxation of labour (see figure 1).

$$\text{Tax wedge} = \frac{\text{Income tax + social security contributions (total) + payroll tax}}{\text{Gross wage + employer ´s social security contributions + payroll tax}}$$

Fig. 1: Tax wedge (Dolenc and Vodopivec [10])

Buscher et al. [7] argue that labour taxation widen the wedge between employer´s costs and employee´s income. If taxis are transferred on employers then employment costs rise and eventuality is that labour demand will fall. If firms compensate this additional costs by lower wages than the wage/price of product ration will not change. Indeed, the consumption wage/price of product ratio declines. Then more households can obtain social benefits and their incentive to work is reduced. Hence, rising labour taxes have a negative impact on employment. Daveri and Tabellini [9] controvert this argumentation on the basis of Scandinavian countries – they ask why unemployment is so low while high labour taxation in continental Europe evokes high unemployment. One possibility how to make clear this contrast is connectedness of high degree of centralisation and co-ordination, which can reduce wage claims.

According to [2] tax wedge means that real take-home pay is lower than pre-tax real wage. If that tax wedge increases, than implicitly consumption grows more slowly. Authors make reference to tax wedge changes may affect not only the bargaining stance of unions but also individual labour – supply decisions. This holds if generous unemployment benefits exist.

Table 3 represents total tax wedge and its components. The tax wedge is expressed through the use of percentage rate of overall labour costs. The individual components of tax wedge differed significantly – V-4 countries had the lowest income taxes (except Hungary) and its percentage rate was almost half in comparison with EU-15 average (14,2 %). Scandinavian countries (Denmark, Finland and Sweden) and Germany or Belgium had the highest income taxes. We can see significant differences in the percentage rates of social security contribution too - workers in Poland, Netherlands, Austria or Germany paid the highest amounts while workers in Ireland, Spain, Finland or Sweden paid the lowest amounts. If we look at employer´s social security contribution rates, employees in France, Hungary, Czech Republic, Sweden, Italy, Spain and Germany had the highest rates in EU. The lowest rates existed in Anglo-Saxon countries: USA, United Kingdom and Ireland.

We can find some comparative advantage in the last column. This column represents labour costs in US dollars with equal purchasing power. The tendency is that labour costs in new Member States convergence to EU average. It is evident that this comparative advantage will not last forever. We have to look at other indicators to determine long-term criteria of competitive strength on the basic of the future outlook. This alternative indicator could be the total tax wedge. If we look at this indicator we can see that comparative advantage will disappear. Only two V-4 countries (Poland and Slovakia) had lower total tax wedge in comparison with EU average (41 %). Hungary had significantly higher total tax wedge (54,1 %). We argue that foreigner investors can make decision on the basic of the total tax wedge (because total labour costs converge in long-term period in EU) which it may subsequently end in that they can prefer countries with lower rate of the total tax wedge.

If we look at V-4 countries we can see, except Hungary, minimal differences between two observed groups. If we look more precisely we find out some differences between countries – e.g. Czech Republic applied notably higher level of employer ´s social contribution rates, but in Poland employees paid higher contributions than employer.

Tab. 3: Income tax plus employee and employer social security contributions (as % of labour costs, 2008)

Country	Tax wedge	Income tax	Social security contribution rates		Labour costs[2]
			employee	employer	
Germany	52,0	18,6	17,2	16,2	61 635
Belgium	56,0	21,8	10,7	23,4	59 758
United Kingdom	32,8	14,8	8,3	9,7	56 764
Austria	48,8	12,3	14,0	22,5	56 610
Luxembourg	35,9	13,3	10,6	11,9	56 173
Netherlands	45,0	13,7	17,4	13,8	55 943
France	49,3	9,9	9,6	29,7	51 279
Korea	20,3	4,4	6,9	8,9	50 079
Sweden	44,6	14,8	5,3	24,5	49 798
Greece	42,4	8,0	12,5	21,9	46 044

Finland	43,5	19,2	5,0	19,4	45 887
Denmark	41,2	30,1	10,5	0,5	41 710
Ireland	22,9	8,5	4,7	9,7	40 661
Italy	46,5	15,0	7,2	24,3	39 947
Spain	37,8	9,7	4,9	23,2	39 595
Portugal	37,6	9,6	8,9	19,2	30 708
Czech Republic	43,4	8,2	9,3	25,9	25 690
Hungary	54,1	15,8	12,6	25,7	22 507
Poland	39,7	6,0	18,1	15,6	21 587
Slovak Republic	38,9	7,5	10,6	20,8	19 160

Note: [1] Single individual without children at the income level of average worker.
[2] US dollars with equal purchasing power.

Source: OECD: Taxing Wages 2007/2008. [online][cit.2009/10/13]Accessible from < http://www.oecd.org/document/6/0,3343,en_2649_34533_42714758_1_1_1_1,00.html>.

2.4 Unemployment benefits

System of unemployment benefits and employment protection legislation are two way how to protect workers in case of loss of employment. While EPL protects labour force which is employed and do not invoke any tax burden explicitly, unemployment benefits provide insurance to better part of labour force and UB are financed by social security contributions.

Grubb [15] made reference to most national labour legislations on providing these benefits are strict in one aspect – after certain duration of providing unemployment benefits the unemployed workers are obliged to accept whatsoever job regardless of qualification.

Some authors argue that *„the longer unemployment benefits are available the longer unemployment lasts“*. [7] Higher level of unemployment benefits and longer period of providing reduce the gap between income from working activity and transfers which means that the initiative to work is lower. According to Jackman, Layard and Nickell [16] unemployment benefits operate through dual mechanism: i) they reduce fear of being unemployed and ii) they restrain the effectiveness of filling new jobs by unemployed and subsequently employers are hustled to wage increase.

Negative effects of generous system of unemployment benefits can be offset by active labour market policies (if their providing is time-limited and the rules for qualifying exist – e.g. mandatory re-skilling).

International comparison of this institutional aspect is also complicated because only one level of replacement rate does not exit in any state. Individual unemployment benefits systems in member states of EU take into account number of specific personal and family circumstances of unemployed, previous job history. Hence EU member states apply different system of unemployment and social insurance. In some countries unemployment benefit are taxable.

OECD in order to compare unemployment benefits systems creates an indicator called ***replacement rate***. This indicator gives the relation between income during employment and income during period of unemployment. We can count this indicator as a ratio which means that the closer the values are the less difference between wage and unemployment benefit is. We distinction between i) *gross replacement rate*, which is pre-tax ratio of wage and unemployment benefits and ii) *net replacement rate*, which is after-tax ratio of wage and unemployment benefits.

[7] Jackman, Layard and Nickell [16, pp.1]

If the net replacement rate does not much differ from income from employment than we talk about *unemployment trap*.

Tab. 4: Net replacement rates (data 2007)

	Initial net replacement rate (as % of net earnings in work)-two-earner married couple	Net replacement rate for long-term unemployed-two-earner married couple	Net replacement rate over a 5-year period following unemployment (overall average)
Austria	81	59	59
Belgium	71	67	63
Czech Republic	80	52	32
Denmark	77	58	66
Finland	77	57	62
France	81	45	57
Germany	89	54	32
Greece	60	44	20
Hungary	82	53	21
Ireland[2]	66	56	60
Italy	82	56	7
Luxembourg	93	49	24
Netherlands	83	50	38
Poland	64	50	40
Portugal	93	46	48
Slovak Republic	83	48	9
Spain	87	45	37
Sweden	74	46	43
United Kingdom	53	52	59

Source: OECD Benefits and Wages Statistics [online][cit.2009/10/13] Accessible from <http://www.oecd.org/document/29/0,3343,en_2649_34637_39618653_1_1_1_1,00.html>.

From the Table 4 we can see that individual initial replacement rates (IRR) among the EU countries differ considerably. Lowest setting of IRR was monitored in Great Britain (53%), while Portugal has reached 93% IRR. Differences were recorded also in the V-4 countries, where the lowest setting of IRR was in Poland (64%) to the highest Slovak Republic (83%). Differences in net replacement rates for long-term unemployed (two-earner married couple) were not so notable as the previous rates and they varied between 44% (Greece) and 67% (Belgium). In addition in the case of net replacement rates over a 5-year period following unemployment (overall average) were noted considerable differences. Strict setting of this rate existed in Italy (7%) and Slovakia (9%). On the opposite side stood Finland with 62 %, Belgium with 63 % and Denmark with 66 %. We can find rates of remaining V-4 countries in the group of countries with a lower rate.

3. Conclusions

This paper deals with labour market perfomance in V-4 countries. If the autonomous monetary policy is no more available, economic theory defined the labour market flexibility as

an instrument for adjustment process in case of asymmetric shock. Another need of the labour market flexibility is resulting from maintenance or increase of competitive strength.

On the assumption that Eurozone states, which had mostly lower overall labour market flexibility then V-4 countries, then we suppose that accession of Czech Republic or other new member states will not mean increased costs for present Eurozone states. It is true, that Eurozone has not been hit by significant asymmetric shocks which would prove theoretical literature conclusions yet. Though we are in essential agreement with argumentation that labour market reforms are unavoidable. This holds for countries of continental Europe and south Europe. If we look at situation in V-4 countries we assume that the need for labour market reform arise not either from future adopting single currency but from demographic situation and structure of social and pension system. In these boundaries future accession into Eurozone may subserve as an exogenous anchor (we can see similarity in accession of the Czech Republic into EU, which also subserved as an exogenous anchor during complicated transition process).

The comparative analysis provides these conclusions:

- Most V-4 countries had similar higher tax wedge compared to EU-15 (except Hungary).
- Strictness of employment protection legislation among V-4 countries is lower in comparison with EU-15.
- Coefficients of union density and union coverage of V-4 countries were close to valuable of 1 (except Poland) which means that bargaining power is corresponding to union membership.
- Wage bargaining coordination is among V-4 countries significant lower. This is given in that wage bargaining takes place on firm level.
- V-4 countries are among the EU Member States with stricter setting of net replacement rates.

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THE IMPORTANCE OF THE FLEXIBLE FORMS OF EMPLOYING

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Abstract: *The major task of paper is realisation of actual trend analysis in employment policy at european labour market in regard to exercitation of flexible models of employment and labour management relations between employers and employees. The writers are trying to answer a question of problems that employers have to cope with because of such unstable and constantly changing climate of european labour market. They are also explaining which flexible forms of organisations and forms of management, used in companies, employers are responding to these challenges and further more what are the requirements for the employees and their acceptation of flexible employment relationship (preparedness to respond to changing requirements of labour market and job positions).*

Key words: *Flexible Labour Relations, European Labour Market, Trends in Employment Policy.*

1. Introduction

In order to increase their economic effectiveness and competitiveness, the West-European companies are moving towards more effective use of employee's working time, implementing of flexible forms of employment and managing the personal work. The issue of the flexible labour relations is not a new feature neither in the employment policy on European labour market nor in the academic researches. Present managerial practice believes that the success of organization is determined by its flexibility, mobility of labour power and the readiness of all units of production process to accept the labour market requirements and react on the changes in the organizational practice and in the labour relations. Only the creative and flexible people can build up the flexible forms of job organization and corresponding organizational structures. The present character of job organization and up-to-date management methods requires not only well educated workers capable of learning new specific knowledge and acquiring the needed skills, but the workers, who are skilled and personally and psychologically ready for changes as well.

Texible labour relations are caused by certain economic trends and corresponding changes on the labour market. Therefore, it is important to know, what they mean for a company and its management and which problems or tasks these rather new features in the job organization solve. The other side of employment relations – employees is also the part of these restrictions and employment policy. It is important to know, how these elements of employment strategies are seen by employees themselves, how they correspond with their interests and requirements, how they understand, evaluate and accept them. Enterprise can succeed only when its employees accept its goals.

2. Flexible labour relations in the policy of employment

Structural changes and the mobility of labour power are under the influence of technological innovations and re-structuralisation of the economy. They are the subject of the scientific analysis and exploration on labour market [9]. State of unemployment in the West-European context is the result of the qualification differences within the job and labour power structure, what means, that low-qualified people do not employ themselves and thus those high-educated

can easier get a job and therefore the risk of unemployment decreases [2]. The emphasis in the employment policy is given on education and effort to keep the most of population in the educational process. From this point of view, the increasing of the mobility and opportunities for workers' employment on labour market are expected [4, 5]. This is mainly caused by realisation of one of the serious social functions and partly by state policy of employment – to offer job to those, who look for them.

Eterprises concentrate on the problems, which are immanent for them. For example the global trends in the world economy development like the production and capital concentration, which is provided in processes of national enterprises merging into the big worldwide multinational corporations, internationalization of production, sophisticated production development or shortening of the products life cycle on the market contributing to strengthening of the competitive pressure on producers. Development of sophisticated production and up-to-date technologies leads to over-employment both from short and long point of view. When enterprise changes productions character, technologies and corresponding ways of job organization, it forces it to change the structure and number of employees as well. These are the main elements obstructing such an act.

On the other hand, the needs of structural and production reorganization of enterprises lead to the short-term over-employment. Connection of the need to maintain the market position in the conditions of tough competition and the need to provide the production or organizational enterprise re-structuralisation regularly leads to the need to decrease production costs and number of labour power. Discharging of employees does not solve a problem because of marginal financial costs.

What does it mean for the enterprise when it perceives the over-employment and due to the high financial costs it has no opportunity to discharge? One of the solutions could be shortening the labour expenditures. Discharging is not acceptable because it increases the financial costs and also the problems for enterprise. Decreasing of expenditures is possible when work time of employees is shortened and adequate decrease in wages provided. In such case the enterprises transfer own financial problems on employees.

The form of such actions after pre-agreements with labour unions and labour offices are so called labour quotas, shortened labour duration, labour contract on restricted period, etc. Realisation of these labour relations allows the enterprises to decrease production costs, to solve own actual problems and to maintain or even to strengthen market position [11]. Similar level is advantageous for enterprises when labour capacity has to be maintained. Labour rationalization is provided by standard but also by shortened form of employment in order to keep full labour capacity and thus to decrease total labour costs.

Transferring the responsibility for bad state on employees or sharing the expenditures by employees in the process of crisis solution is common in present economic practice. Firms are only willing to solve current problems and strengthen market position and thus to avoid bankrupt or cancelling the enterprise. In the case of short-term period of solution the problems, firms return to standard labour forms of employment – to tariff duration of working time, standard labour contracts, evaluation criteria etc. Enterprise can save the structure of labour places, principles of organisation, management and personal.

Firm can obtain several advantages: it can strengthen own market position and increase competitive position. For example, cost relevant and short-term flexible personal management allows to increase the competitive ability and orientation on customer by shortening and homogenisation of supply periods, to improve overview of the short-term working time

capacity, to avoid short-term employment, to increase certainty of labour place, to protect employee on a basis of objective customer-oriented criteria. In this case firm must calculate with higher planned expenditures to determine suitable labour time system (the need to plan personal).

Despite of avoiding discharging of personal in the period of bad entrepreneurial climate, it is not useful for the firms; these processes are usually evaluated by non-entrepreneurial subjects in practice (e.g. scientists, labour union representatives, state or scientific administration) as a way of unemployment solution. Even enterprise management generally agrees with this evaluation because it contributes to their authority and image. Two main functions of flexible acts – solution of economic and market difficulties and solution of unemployment are obvious part of the scientific analysis and publications. Solution of certain difficulties of firms usually moves ahead solution of unemployment problems. Effective enterprise functioning, increasing of turnover and performing on attractive and prosperous markets requires higher production capacities, capital and human resources. Temporal decreasing of human capital usage in the period of economic difficulties contributes to unemployment problems solution, though. If we have a look at the period of economic difficulties, they are often solved by non-standard employment strategies loading the employees - a human capital.

3. Searching for the reserves in the effectiveness and ways of the economic problems solution

Implementing of the flexible labour relations in the strategies of employment of the West-European firms and companies occurs at the end of 1960's and at the beginning of 1970's Successful after-war development of the West-European economies was at the end. Further economic development requires imperfection of labour quality in all spheres of the economic activities – in new products, in new technologies, in new marketing conceptions, methods of communication with customers, in new organisational structures and management styles. Competitive tension increases and thus firm difficulties become risky for it to stay on the market. Firms try to avoid the economic difficulties (such as decrease of sale, lost of market segment, increase of input prices) by implementing the flexible elements in the labour relations and thus transfer the risk of existence on employees.

As the first and mostly spread flexible acts firm applies reduction of working time on one working day, working week, working month or year. The most common is capacity per week. Firms apply their requirements on flexibility after discussion with labour union representatives in a form of time quotas. The application of flexible labour relations grew since 1975 till 1991 in the European union countries from 3 to 26 per cent. In 1991 in the countries as The Netherlands, England, Denmark every fifth firm applied time working quotas or reduced working time. In Germany it was only at the level of 7 per cent [6].

In next years to come the other new forms of flexible actions within job organisation and labour relations between employers and employees were announced. For example, at the beginning of 1970's German enterprises perceived statements such as "two-week delivery date", "now in October", "full employment at the year-beginning" as impossible. The main task of firm management was to provide homogenous delivery dates for the whole year and thus to avoid significant fluctuations as temporal discharging, shortened working time, etc.

Progresses in the questions of job organisation and realisation of labour relations in the countries with developed economy have changed significantly. Certain organisational changes at work and in forms of employment were connected with creation and application of tele

working (job outside the working place). The assumption for creation of such labour forms was development of communication technologies which allowed immediate connection and communication of worker with working place and if it was necessary, also delivery of results by phone, fax, Internet and other communication tools. Worker can stay at home, nearby customer or supplier, market partner etc. The forms of tele working are home tele working (working place in the household and working place at once), mobile tele working (most of the working time spent outside job – business trip, visits of customers), tele working in SONOs (small office, home office).

Tele working does not cause problems of its acceptance by employees like the other flexible labour forms. The most of employees judge it positively and find it acceptable. According to the results of empiric research, tele working allows 72% of responders to optimally join occupation and private life, 50% can save time, 37% can better organise leisure time and vacation, 21% save travel costs, 3.6% solve health problems, 1,1% can further educate themselves and 0,7% can avoid unemployment [7, S. 74-83].

Job Sharing-model became one of the flexible form of job organisation in 1980's. Its nature is voluntary division of work place and capacity of working time and also of the responsibility between two managers [10]. Managers see the attraction of this model in an opportunity of avocation, usage of leisure time for different activities, for life-long education, for solution of health problems and for widening the individual time space. Next, divided working time allows to work with a pleasure, concentration and engage what brings success and full use of own skills. But the major lack of dividing working time between two managers is an absence of opportunities to prove and to do something [12].

More difficult to organize job in practice is when enterprise uses different forms of shortened working time. In research provided in 1998 on a sample of 252 895 employees from various branches of industry and services, the shortened working time was also positively evaluated. 56,1% of responders said that shortened time allowed them to focus on different jobs, firms and technologies; 18,1% could avoid the unemployment; 12,8% could get different job position, working place or move ahead in the carrier; 9,4% could provide flexibility/mobility; 8,1% could retire or get new social contacts; 6,4% could become independent; 3,1% saw shortened working time as a chance to seek for new opportunities [14, S. 84-85].

Realisation of timely shortened forms of occupations often faces difficulties with its acceptance from the side of employees and from the side of labour unions to avoid agreed tariffs, though. Mentioned negatives from provided research can be summarised as follows: financial looses face 44,2% of responders, 26,1% do not prefer flexibility concerning working place and activities of colleagues, shortened vacation (8,6%), bad image (4,7%), few work activities (3,6%), absence of special and professional growth (3,6%), and negative influence on leisure time use (2,8%) [15, S. 169-171].

On the other hand, acceptance of shortened working time and further reduction of employees' salaries is not easy. The experiences of Volkswagen are concrete example of survival without mass discharging of employees. In 1994, due to the decrease in car sales and lower revenues, the enterprise found itself in financial and economic difficulties. Traditional approach in solving of these situations could not avoid mass discharging and production reduction. In this case the automobile management chose different way of solving the economic difficulties. Basic decision of management was to avoid mass discharging. After the agreement with labour union management proposed to shorten working time from 35 to 28,8

hours per week. These restrictions affected 35 thousand workers. Despite of sceptic assumptions, most of the employees accepted this proposal to shorten weekly working time. 49% of VW workers agreed with this restriction and only 16% disagreed. In the category of employed women, even 58% proclaimed agreement [13, S. 35.].

Shortening of working time from 35 to 28,8 hours per week was only one of the restrictions to be made. Improvement in the organisation and labour management increased its intensity, efficiency and they excluded unnecessary work positions. In fact, almost reduced number of employees did original production. There were no actions taken to reduce the economic production. It meant that lower number of workers (in fact the same number of workers with shortened working time) was doing the original range of planned hours. No doubt these actions were successful. The scientific and general entrepreneurial public called these actions as "28,8 hour week", "four-day week", "new unpredicted working time", "oriented on market rhythms", and "the first effective tool to beat crisis" [3, S. 79.].

The results of this managerial innovation were clear not only in the theoretical level. Automobile company avoided mass discharging and maintained the employment in original level. Solution of this problem in concrete critical situation increased credit of such managerial decisions as flexible forms of employment and labour relations. The automobile company constantly handled with the economic and financial difficulties within two years. Even in 1996 working time in Wolsburg and Kassel increased to 31, in Emden to 33, in Salzgotter to 34 and in Hannover to original 35,5 hours. More than 3 thousand workers were admitted one year later [1, S. 141.].

Similar practics are applied at the same time on the labour market in France and other esteuropean countries, where the working time is being reduced to 35 hours per week (14, S. 132-133).

Publicity of mentioned restrictions within the entrepreneurial and scientific community did not reach an adequate level. Both enterprises and firms with similar problems, nor specialists from advisory agencies searched for the experiences from experiment provided by Volkswagen. Since the euphoria from unique managerial decisions was gone, several doubts against them arose. First, the economic difficulties were not conquered by implementation of flexible labour restrictions only. Their share in a structure of another restrictions and their role in solution of the economic problems of German automobile company cannot be measured preciously.

Second, these restrictions are different and even contradict to each other [8]. While another actions in this model belonged to the area of labour intensification, organizational structure and management methods, working time reduction was connected with using of one of the most important production sources – a labour power. Since this is only a mechanic reduction of labour power and is not part of implementation of more productive technologic actions or innovative organizational and management elements, it can be hardly part of progressive economic actions.

Third, suitable and effective managerial experiences for the economic conditions of Volkswagen Company should not succeed in the other conditions, in another time and in another firm. The presence of economic difficulties connected with unfavourable situation of German economy, high rate of Euro, slowing down of growth in the automobile industry with low interest for new model Golf that was supposed to become the main source of revenues and profit does not motivate the automobile company to follow the same restrictions taken in the past. According to saving plan "For Motion" to obtain profit at least in the level of 2003 (net

profit dropped from 2597 mill. Euros in 2002 to 1118 mill. Euros in 2003) concern is to restrict the production and operative costs, to simplify production processes, to support sale and to discharge 5000 employees. These restrictions should save 2 billion Euros. Next 600 mill. Euro should be received after retirement of employees [16].

The results of the research of using of the flexible forms of employing in the automobile factories in Slovakia and Germany, which was made in 2007 within research project supported by the academic agency of Germany DAAD, are almost the same as the datas stated above and acquired more than ten years ago. There have been used different forms of flexible labour relantions in researched factories, even under the conditions of the drop of unemployment. For example, nonfixed working time quotes were used by 83% of the asked factories, adjustable salary tariffs – 63%, overtime work - 98%, workers hired in personnel agencies - 75%, time limited labour contracts - 73%, labour contracts for a part time work – 48%, temporary labour contracts -32%.

In most automobile factories in Slovakia within the years 2005-2007, the using of the nonfixed labour time quotes rose to 20%, time limited labour contracts to 28%, workers hired by personnel agencies to 26%. These data are in a quite tigh correlation with the drop of the level of unemployment in Slovakia within these years. This can mean, that a high amount of employees gained their labour contracts with limited working time or the labour contracts for definite period of time and that is why they were not registred by the labour office. This fact shows the positive influence of the flexible forms of emloying on the level of the unemployment.

All actions of saving plan “For Motion” were supposed to save about four billion Euros by the end of 2005. These restrictions also faced VW Slovakia. It means that present management sees the main outcome from present economic difficulties in reduction of employment costs. This fact allows to anticipate that flexible labour relations might have not been dominant element in saving the financial capital, nor in decreasing total operation costs. Or, on the other hand, it was not determined whether realized flexible actions were the main source of savings and solution of former concern economic difficulties. Therefore, present management considers as the best way of solution of problems to discharge the employees. Liberal approach of state and labour unions to strict rules of discharging the employees in conditions of current economic situation in Germany is helpful. Implementation of similar actions and their economic effectiveness maintain open questions of organizational system and labour administration between employees and employers.

4. Conclusion

Labour relations as a source of solution of economic difficulties and unemployment problems are still considered by entrepreneurial and scientific community and they are subject of managers’ decisions. Cases of effective managerial decisions connected with implementation of flexible labour relations did not become suitable experience for the application in the other firms and in the other economic conditions. These experiences even showed that flexible actions were not always the effective tool in solving the unemployment problems and firm economic problems. These flexible actions still remain an open question of the economic practice and the subject of theoretical thinking, empiric researches and managerial decisions. Firm management understands that success of any organisation can be determined by the labour force mobility and readiness of firm to accept and flexibly react on labour market requirements.

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INSTITUTIONAL QUALITY STATES EU-12

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Abstrakt: *The article deals with problems of institutions, ways of assessing and measuring their quality. At the theoretical level based on the text of a concept of institutional economics. In her conception of the institution are set out the rules and constraints that determine the evolution of society and economy of the country. In the article we first performed a comparative discussion of the methods of measurement and evaluation of the quality of institutions, available on latest stage of knowledge. In order to capture real trends in the institutional convergence of new Member States of the European Union (EU-12), we applied a statistical methodology for the World Bank's Governance Matters.*

Keywords: *Institutions, Iinstitutional Economics, European Union, Assessment and Measurement of Quality OfIinstitutions, Iindices of Iinstitutional Quality, Methodology Governance Matters.*

1. Introduction

In the past twenty to thirty years the growing interest of economists on the impact of institutions to underpin economic prosperity of the country can be seen. The growing interest in this area is also associated with the collapse of the socialist bloc countries of Central and Eastern Europe. These countries started the process of transformation, the essence is the definition of new "rules of the game, the new economic and political institutions to achieve economic stability and desirable economic growth. [1] [5] An interest in institutional factors, particularly increases in empirical analysis, which examined the causes of differences in economic performance between countries, respectively groups of countries. Institutional factors extend the range of variables by which economists explain the realized long-term growth of countries and persistent disparities between developed and less developed economies. Nowadays, several national and international organizations focus their global efforts to create and design various **indices of institutional quality** as explanatory variables to examine the historical, cultural, political and economic determinants, and whose aim is to express precisely the degree of political and economic quality of public sector and private sphere. These indicators represent the particular additional information to objective data, allowing better explanation for the causes of various economic phenomena. The indisputable advantage of these approaches is a comprehensive global view of the economy where efficiency and competitiveness of the economy evaluated on the basis of both hard and soft data and data on institutions to illustrate the basic indicators.

Trying to quantify the quality of institutions has resulted in great deal of indices. Some of them are unique in nature, thus uniqueness, because their design was conducted to capture and analyze only the particular, specific purpose. Data that are used to design unique indices are gathered on the basis of specific surveys, questionnaire surveys, especially the views of companies and people. Other indices are compound, composite and represent a comprehensive, long-term, well-developed methodology used for regularly repeated international comparisons. These methods usually combine different types of data (cardinal data and pliable data) and the sources of acquiring knowledge (statistical databases, expert

evaluation, investigation into the companies and people, etc.). Both approaches can also be used as the characteristic effect of institutions on economic performance and competitiveness of the economy, and in comparison of institutional quality and its development across countries in time intervals. Despite the existence of sophisticated, alternative, sophisticated approaches, which can now reach an estimate of quality of institutions, either at national or at the detailed level, it is clear that the conceptual quality is measured only with great difficulty. The vast majority of data available for analysis of the institutional environment can thus obtain in the form of widely available statistics (so-called hard) data. But there are other limitations in the practical application of these indicators, which should be respected.

Although in the case of measuring quality of institutions is a very young field of research that is still evolving, rapidly improving with the way its growing importance. Long-term monitoring of developments and dynamics of institutional change is able to recognize the risk of development of individual states and to identify barriers to their further development.[4] Currently one of the most watched characteristics of the institutional environment, notably the quality of democracy, the degree of freedom, political rights, and quality of regulation, bureaucracy and corruption. In particular, the measurement of democracy and political governance enables citizens to evaluate and compare the performance of the entire public sector and also helps to express support or dissatisfaction to the government. Results of the evaluation may influence the decisions of voters in elections and strategic decisions of firms, banks and financial institutions.

2. AIMS and Methodology

With respect to above mentioned, we focused on assessing the quality of development institutions within the EU-12. We used a statistical methodology yet Governance Matters. This methodology was applied to a group of EU-12 to affect the trend in the institutional convergence of new EU Member States. The function of the methodology is the detection and qualitative analysis of possible institutional trends in Europe. Firstly, we conducted comparative research on institutional quality in the individual EU Member States, on the basis of available partial indicators of institutional quality. Using time series values sub-indices of institutional quality, we then compiled a comprehensive index of institutional quality.

Regarding the methodology of Governance Matters itself, the reason of its processing was the interest of the World Bank to cooperate in the global effort to improve the quality of institutions through effective use of their resources. [1] Ratings of institutional quality countries is realized through design of the general index of **GM (Governance Matters)**, which the World Bank regularly publishes since 1996[1].

[1] Until 2004, the index was published every other year intervals. Since 2004, the index is published for a large public interest annually.

The resulting aggregate index is based on several hundreds of individual measurements, run by international organizations, consulting firms, universities, political and business organizations estimating the risk (risk-rating agencies), center experts and NGOs, which mainly relate to **perceptions of quality management**[2]. **Combined data obtained expert estimates and the data obtained on the basis of a questionnaire survey of companies and people**. The World Bank methodology is based on the definition of institutions as components of the state government (state capture). The government and the quality of governance by the World Bank is seen as a key element of the determinant of a country's level of potential development. It is characterized as the *"traditions and institutions by which power is exercised"*. [2] This definition thus includes three basic components of quality management, each of this folder are assigned to two aggregated indices, the **so-called institutional quality indices (Index of Institutional Quality, IIQ)**, which describe the situation in the country. The selection process, monitoring and replacement of Government (air bearing GM 1 and GM 2), effective aspect of the government's capacity to formulate, introduce and implement a "healthy" policies (indices 3 and GM GM 4) and the aspect of respect for the citizens and the State institutions are taken into account which determine mutual relation whether the interaction of economic and social (indices GM 5 and GM 6).

Ø *GM 1 - The level of democracy, political rights and freedoms (Voice and Accountability)*, which is assessed by means of participating in choosing their government, their populations, if possible free speech and assembly and the freedom and independence of media,

Ø *GM 2 - Political stability and absence of violence*, this indicator reflects the perception of the possibility that the government will lose its stability or will be directly overthrown and resources that are not constitutional or violently, also includes an indicator of political violence and terrorism,

Ø *GM 3 - Efficiency (performance) of the Government (Government Effectiveness)* monitors the quality of public and private services, competence and degree of political autonomy and bureaucratic organization, the quality of shaping government policy and its implementation and the degree of compliance with government commitments,

Ø *GM 4 - Quality control (Regulatory Quality)* focuses on the ability of government policy to promote and develop the private sector, measured the impact of price regulation, banking supervision and regulation of foreign trade,

Ø *GM 5 - Legal Procedure (Rule of Law)* is an indicator of confidence that the company has the legal system in the state and the willingness with which the public is adjusted to the new legal standards, the index assesses the extent of crime and violence and the efficiency of the courts and police, etc.

Ø *GM 6 - Control of Corruption* monitors how Government uses its power to private interests or the interests of prominent so-called elites, as well as monitor corruption in both small and large.

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[2] In the period 1996 - 2008, the number of resources, institutions and countries involved in the construction of the index continuously changed depending on the availability of data. In 2002, for example, used a total of 250 individual measurements, based on 25 different sources and produced 18 different organizations. In 2004, the final comparison included the total of 209 countries evaluated the total of 37 sources originating from 31 independent organizations. Currently, these aggregates include 340 sub-indicators, which are derived from 35 sources from 32 organizations with international connections. Included were 212 countries.

Tab. 1 Components of quality management and their related indexes according to the World Bank:

Components of the duality of administration	Indices of institutional duality - IIQ	Mark
Processes by which governments are selected, controled or replaced if needed	The level of democracy, political rights and freedom, the independence of the media *(Voice and Accountability)*	**GM1**
	Political stability and absence of violence (Political Stability and Absence of Violence)	**GM2**
Government's ability to formulate and effectively implement "sound" policy	Performance (efficiency) of the Government (*Government Effectiveness)*	**GM3**
	Quality regulations, measuring the impact of price regulation, banking supervision, regulation of foreign trade *(Regulatory Quality)*	**GM4**
Respect of citizens and the state institutions that govern economic and social processes between them	Rule of law, the impact of crime, effectiveness and foreseeability of judicial decisions *(Rule of Law)*	**GM5**
	Control of Corruption *(Control of Corruption)*	**GM6**

Source: World Bank, available from www: <www.worldbank.org>, translation and editing autor

In all indexes the countries are classified according to the common interval <-2.5 to +2.5>. The higher the value of the indicator the better the perceived quality of the relevant constituent authorities is. The final index reflects the result of statistical research, but it neither shows the official standpoint of the World Bank nor the real position of the countries which the Bank assesses. The complex index of GM is calculated as the simple average of indicators G1 - G6 and represents the problem of developing countries which is the Bank most importantly interested in. The purpose of the evaluation is to assess the overall situation of the quality of governance in the country and the results will set the program for further economic development. Although with each new measurement indicators as GM and methodology and sources used, the indicators of past evaluations are recalculated. [1] This can guarantee the comparability of published data to some extent. It should be stressed that the World Bank's research is among the experts considered to be the high quality and reliable scale in the area.

3. Results

Our goal was to capture the process of institutional adaptation to EU-12, which is very important process for transforming economies which face the problem of finding and creating a competitive institutional setting (eg, by means of its imitation of advanced countries). The aggregate indicator of institutional quality is calculated as the arithmetic mean value of

individual indicators of institutional quality of GM 1 to GM 6 in the country selected for a given year. The following tables (Tab. 2 and Tab. 3) summarize the value of GM's overall indicator for the EU-12 and EU-15 in the period 1996 - 2007.

Tab. 2 Summary values of indicators of institutional quality of the EU-12

Summary values of indicators of institutional quality of the EU-12									
	1996	**1998**	**2000**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Bulgaria	-0,29	0,07	0,14	0,26	0,21	0,25	0,23	0,23	0,24
CR	0,86	0,76	0,64	0,85	0,83	0,75	0,82	0,83	0,80
Estonia	0,66	0,76	0,86	0,96	1,04	1,04	0,99	1,05	1,06
Cyprus	0,98	0,89	0,92	0,95	0,95	0,88	0,89	0,98	1,00
Lithuania	0,31	0,54	0,52	0,72	0,84	0,79	0,77	0,71	0,72
Latvia	0,19	0,45	0,46	0,63	0,76	0,68	0,68	0,73	0,68
Hungary	0,73	0,90	0,88	0,98	0,94	0,91	0,87	0,87	0,80
Malta	0,62	1,06	1,17	1,20	1,32	1,26	1,19	1,26	1,31
Poland	0,66	0,72	0,64	0,65	0,64	0,51	0,52	0,46	0,48
Romania	-0,13	0,00	-0,09	0,01	-0,03	0,01	0,02	0,11	0,12
Slovakia	0,43	0,47	0,47	0,61	0,71	0,73	0,79	0,81	0,72
Slovenia	0,95	1,10	0,87	1,02	1,00	0,98	0,92	0,96	0,95
EU-15	1,44	1,43	1,43	1,48	1,45	1,40	1,36	1,39	1,35

Tab. 3 Average values of indicators of institutional quality of the EU-15

Average of indicators of institutional quality of the EU-15									
	1996	**1998**	**2000**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
GM 1	1,40	1,25	1,21	1,38	1,28	1,32	1,30	1,35	1,27
GM 2	0,90	1,04	1,11	1,01	0,94	0,78	0,77	0,91	0,91
GM 3	1,81	1,74	1,69	1,71	1,66	1,61	1,55	1,52	1,42
GM 4	1,21	1,10	1,28	1,56	1,51	1,48	1,40	1,39	1,41
GM 5	1,63	1,60	1,58	1,52	1,56	1,53	1,51	1,48	1,50
GM 6	1,67	1,87	1,74	1,73	1,73	1,69	1,62	1,67	1,61
Average	1,44	1,43	1,43	1,48	1,45	1,40	1,36	1,39	1,35

Source: World Bank, calculations the author

As shown in Fig. 1: Summary indicator of institutional quality ***(author of processing based on data of the World Bank)***, all monitored countries reached lower values than the EU-15. The best results gained Malta and Estonia. The worst results achieved the Union's newcomers Bulgaria

and Romania, which in 2004 amounted to only 0.01. CR is placed in the middle of the monitored countries.

What concerns the indicators GM 1 all countries achieved relatively satisfactory results, which is due to the establishment of democracy in all countries. The democracy is also one of the values which the EU protects together with freedom and social justice. The problem with the perception of democracy can be traced especially in post-communist countries. Monitored countries also achieved good results in the second indicator GM. But neither in this indicator had some country reached negative values. In the evaluation of the effectiveness of the government (GM 3) we do not find such satisfied results because neither of countries reached the average EU-15 and values have a decreasing attempt relating to increasing bureaucracy. GM 4 indicator assesses the quality of regulation. Even in this indicator countries did not exceed the EU-15 average, which suggests a slow introduction of changes to the banking sector and fiscal sector and foreign trade. With the indicator GM 5 The Code, countries maintain very poorly compared to the average EU-15. High-quality legal code of certain country is the precondition for the smooth functioning of the state according to the principles of the functioning of society in the 21st century. In our opinion, this is the reason for governments to adapt the rule of law and its enforcement, and thus contribute to increase trust in the legal system. The last indicator GM 6 monitors corruption, which does not bring the long-term economic stability of the country. It distorts the priorities of government policy, including monetary and fiscal target policies. In this indicator, the monitored countries stack up poorly against the average EU-15. It is necessary to change the thinking of the corruption which is taken as normal element by society. In all indicators index, GM Bulgaria and Romania achieved the worst results and have the most negative assessment of indicators. These countries are not still adapted to other EU states, for which they are still criticised by EU and in some cases penalized. On the other hand Malta and Cyprus gained the best results.

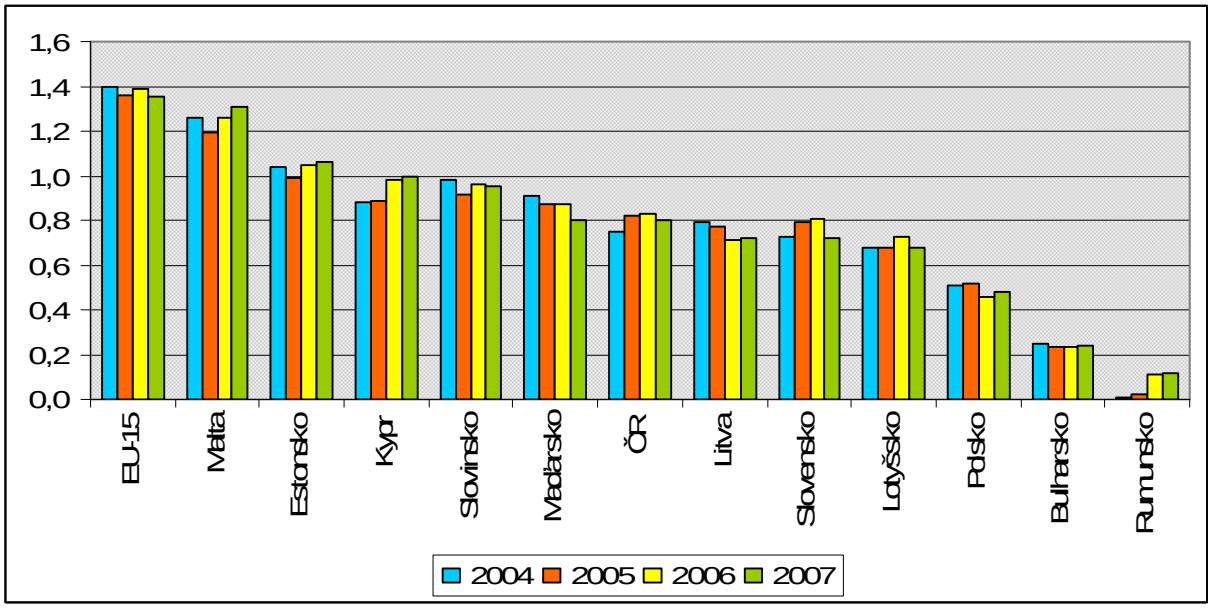

Fig. 1: Summary indicator of institutional quality (author of processing based on data of the World Bank)

4. Conclusion

The main purpose of monitoring the quality of institutions is to assist governments to identify specific aspects of the country and take corrective measures to ensure economic stability and economic growth. [4] Political instability and excessive regulatory measures as well as high levels of corruption discourage foreign investors and domestic entrepreneurs. The development of the institutional quality of the EU analyzed in this article confirms that the process of gradual enlargement of the EU has a positive effect on the transformation and building a new institutional environment in the new EU Member States. Although the EU-15 average characterized by higher quality institutions than the new member countries, the pace of economic growth in EU-15 is much slower and institutional quality in comparison with the countries of the EU-12 is stagnating or getting worse. The success of institutional reform is particularly evident in Cyprus and Malta, but also in Estonia and Slovenia. Although these countries still do not belong to the economically most powerful, they have already begun to reform affect not only of the existing production capacity of economies of these countries, but also their long-term potential.

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