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János SZLÁVIK – György HORVÁTH

Abstract
Whether an administrative unit is capable of living up to the tasks set forth depends on how well it is capable of fulfilling its duties in sustainable development. Experience shows that certain units are overburdened with duties and functions, which would otherwise be more efficiently carried out at different levels. This is partly true for lower-level administrative units, whose tasks are plentiful, but their resources are insufficient for their tasks. On the other hand, this is also true for higher-level administrative units, where the resources may be present, but a sensitivity towards local issues may be lost. As both of these are essential for sustainable development, reforms ought to consider both aspects simultaneously. Fundamentally, Visegrád States have implemented the principle of decentralisation to its fullest, but seemingly they have misinterpreted the provisions of the principle of subsidiarity. From the aspects of sustainable development, a reconsideration of the application of these principles would be desirable.

Keywords: European administrative systems and administrative reform, regions, local administration, sustainable development, Visegrád Group

Abstrakt
Skutočnosť, či je správna jednotka schopná plniť stanovené úlohy záleží od toho, ako dobre je schopná plniť svoje povinnosti v oblasti trvalo udržateľného rozvoja. Skúsenosti ukazujú, že niektoré administratívne a správne jednotky sú preťažené povinnosťami a často plnia funkcie, ktoré by bolo efektívnejšie vykonávať na iných úrovniach samosprávy. Pri prenesení kompetencií na nižšiu úroveň správnych celkov možno naraziť na nedostatok zdrojov a chýbajúce kapacity, na druhej strane to platí aj pre vyššiu úroveň správnych celkov, kde môžu existovať zdroje a kapacity, no citlivý prístup k riešeniu niektorých lokálnych problémov a úloh môže absentovať. Pretože obe aspekty sú nevyhnutné pre trvalo udržateľný rozvoj, je nutné reformy v oboch oblastiach posudzovať v spoločnom kontexte. V zásade možno konštatovať, že krajiny Vyšehradskej skupiny zaviedli princíp decentralizácie naplno, ale zrejme majú nesprávne interpretujú ustanovenia princípu subsidiarity. Z hľadiska trvalo udržateľného rozvoja je prehodnotenie uplatňovania týchto zásad žiaduce.

Kľúčové slová: Európska administratívne systémy a administratívne reformy, regióny, miestne samosprávy, trvalo udržateľný rozvoj, Vyšehradská skupina

Introduction

Five and a half decades after the foundation of the predecessor of the European Union, we bear witness to the results of both profound changes affecting our daily life, as well as constructs which have remained essentially unchanged since the foundation. One of the most important aspects that have remained unchanged is the inherent diversity of the Union. As this entity grew from comprising but six to hosting twenty-seven member states, diversity has enriched the Union, and has made it an increasingly colourful place. However, as a consequence of this, managing 27 states with nearly half-a-billion inhabitants remains a challenge, which has called for responses on all levels: local, regional, state and Union. Although necessary changes have been initiated, there has been also a varying level of reluctance from member states to carry out reforms. This has also been true to Central European states too, particularly in the Visegrád Group of Countries, which, within their framework of cooperation, have taken to different paths in reforming their administrative systems. Whether these systems are cost-efficient, speedy, or indeed client-friendly is just one aspect of the requirements one must pose against them. They must also be in service of sustainable development.

Political-economic change, cooperation and reforms

After the profound political and economic changes at the dawn of the 1990s, four Central European states forged an alliance, which was to be named the Visegrád Group, after the city of its formation. Its purpose is to provide a forum for co-operation in tackling the challenges and opportunities posed by the recently completed transitions to democracy and free market capitalism. Within months of each other, all four members of the alliance applied for membership to the European Communities - and later, the European Union - to ensure peace, economic stability, and a better quality of life for all their citizens.

The organisation's success was not unlikely, as its members share a number of commonalities. This forum has remained an established platform for coordination between its member countries; however, its true scope is limited. Nevertheless, opportunities for expanding levels of cooperation remain open, and this forum may prove to be a vital tool in the future of Central Europe, but also of the whole of the European Union.

Fundamental tasks of administrative units

Duties and responsibilities of administrative units are legally defined - some are included in constitutions, others are 'only' included in laws and by-laws. At

the moment, duties and responsibilities of administrative units include education, healthcare, sanitation (comprising clean streets and waste management), basic utilities, documentation of private individuals, businesses and properties, but equally importantly, they include environmental protection and sustainability services. We must realise and accept that administration is a key actor in the transition towards sustainable development.

To which level these duties are assigned to vary from country to country. Basically, each state tries to define the levels of execution based on socio-economic, geographic and practical factors. Through what is essentially a process of trial and error, an optimal (or quasi-optimal) level of execution may be found. However, as the type of administrative services demanded change, the provision of services must be adapted too, otherwise inadequacies - economically speaking, externalities - and waste will arise. Services which are no longer needed must be transferred or discontinued, whilst other services demanded need to be established. Some of these services tend to be capital-intensive, and may prove to be economically inefficient under a certain threshold, essentially hindering the provision of quality services to citizens. Such simple economic concepts ought to be considered in lawmaking, by carefully and prudently selecting the appropriate level of execution. Misfortunately, a number of states have to face up to fundaments and constructs enshrined in constitutions, sometimes remaining there for centuries, which at times prove to be outdated, and therefore, hampering.

The European Union aims to provide a better quality of life to its citizens, it has made successive efforts in doing so by declaring unequivocal support for sustainable development. In fact, in its sequential Sustainable Development Strategies, it has also taken to provide for the inclusion of the basic principles of sustainable development in all policy aspects. Obviously, this sets out serious expectations to administrative units, whilst one must realise that at times it is the administrative system itself which may hinder the efficient incorporation of sustainable development into policy measures. [EU-SDS, 2005] This approach to sustainable development has its roots in Agenda 21, and in Local Agenda 21 (LA21) in particular. This programme aims to reach the balance between environment, society and the economy, such that they may serve the long-term aims of sustainable development. LA21 is a complex system-building and management programme, which builds on the strict interpretation of sustainability, one that only permits the conversion of environmental capital to economic capital if the requirements of the biosphere are unconditionally met. This implies that the environment enjoys primacy in any programme based on the strict interpretation of sustainable development, yet it must be stressed that any Local Agenda 21 programme is more than just an environmental protection programme. [Szlávik, 2005]

To benchmark the status of sustainability at a territorial unit, one may need to look at trends in particular indicators, which need to go beyond the basic statistical data describing the economy and demographic movements. A set of local sustainability indicators have been created, which focus on aspects of sustainability which remain hidden through conventional socio-economic indicators. The indicators pertain to three main groups: (1) natural resources, environment and local sights, (2) living conditions, culture and traditions, (3) local economic and infrastructural particularities. [Branner - Csete, 2005]

The European Union provides a framework for such local sustainable development initiatives, which may require reforms to take place. To assist changes, the European Union provides aid for the improvement of services. Convergence, cohesion and harmonisation are likewise a mutual power house behind administrative reforms, but success relies on the willingness of the individual member states to implement profound - and sometimes even painful - measures. Indeed, whether a member state decides to proceed with administrative reforms or not, will have an impact on its efforts in becoming sustainable. As the levels of administration closest to citizens play a particularly important role in efforts towards sustainable development, any changes on this level need to consider their direct impacts on society, the economy and the environment. [Csete, 2009]

Particularities in Europe's administrative systems

A geopolitical map of the European continent will reflect century-old traditions and sometimes turbulent changes. The different levels of administration always needed to follow suit to keep up with the new situations. During much of their history, European states have kept types of administrative units constant - while the actual borders of such units may have been subjected to even frequent changes. Yet at the same time, traces of previous delineations play an important role, often originating from the age of the Roman Empire.

A different trend is also ever more apparent, which points towards the review and restructuring of administrative systems, mostly because of the European harmonisation processes. Even though nearly every single member state had to proceed with reforms, the extent of these varied greatly. Some countries took thorough, even ambitious steps towards administrative reforms, whilst others shied away from such in-depth changes, and settled with minor adjustments. Even within the Visegrád Group of countries the differences in the paths taken towards administrative changes are quite significant. This may appear odd, considering that this organisation was created on the solid grounds of

similarities between its members. Nevertheless, experience disproved expectations, which is reflected in the current administrative structure in these countries.

Diversity is also prevalent on the lower levels of administration, with some countries consisting of exceptionally small administrative units and others less so. There are always rational reasons behind these structures, but one must realise that these grounds may be outdated, so a reconsideration of these units may be desirable from economic, social and environmental aspects.

To assist the development of certain territories - particularly in the newly acceded member states - the European Union and its predecessor have offered development and investment aids, in the forms of structural and cohesion funds. The availability of such resources may represent a serious moving force in the life of a region, provided that some critical elements are present in the first place. To ensure success, it was up to the European Communities to devise a scheme for allocating such funds among its regions of differing levels of development. For this, comparability was desirable, and the idea of a common and uniform statistical scheme was recognised. [Szabó, 2005]

Establishing a common ground for development

Even after the first wave of expansion, the European Communities had to realise that the increasing differences within its territory needed to be reduced, and to achieve this, eligible regions should benefit from subsidies. To assist this, the creation of a scheme enabling planning and statistical feedback was necessary. Thus, the Nomenclature of Units for Territorial Statistics (or *Nomenclature d'Unités Territoriales Statistiques*, or *NUTS*) was created. [Regulation (EEC) No. 2052/88] This scheme could then be used to plan and allocate structural and cohesion fund resources among the different territories, particularly the regions of Europe. Startlingly, formal use of this scheme only began in 2003: prior to that, its use was mainly based on a "handshake-agreement" which parties adhered to. [Szabó, 2005]

The NUTS classification is based on existing administrative entities, and the legislation governing it only allows for administrative units to be clustered together for planning and statistical purposes, meaning that administrative units may not be split to better fit a different NUTS group. However, the Regulation does allow member states to reform and re-structure their administration internally - and it would be sensible to do so if a newer administrative structure would better suit the guideline dimensions of NUTS. It is nevertheless crucial to make the distinction between tool and target: NUTS is there to assist territorial development in the current administrative framework, and not to provide an

outline for possible reforms - even though it is well suited for that. The main issue with the NUTS classification scheme remains that not all NUTS units are existing administrative units, meaning that there may be a lack of coordination and decision-making will become difficult, putting strain on existing administrative units.

The classification scheme poses further challenges in the lower levels of statistical entities. Whereas at the higher levels of statistical units guideline numbers exist for the delineation of such units, at lower levels no such guidelines exist. This is particularly odd in a situation where the number and variety of administrative units is very diverse, which may not necessarily only show in size, but in functions, legal status and assigned duties. However, if we take the struggle for sustainable development into consideration, we must realise that duties and functions on one hand, and legal status and size on the other are not trivial factors. Without a sound balance of these factors, sustainable development may be jeopardised.

Local administration: a fragmented Europe

The European Union is dominated by a great diversity on its lower levels of administration. Some of its member states have thousands of local administrative units, whilst others may only have hundreds. One may think this simply arises from the fact that states differ in size, but as the following table will show, this is not so. The table compares the population, area and the number of units of local administration, the European Commission designated Local Administrative Unit levels 1 and 2.

Table 1 Local Administrative Units across Europe. Source: self-made based on data from Annex to 105/2007/EC

Member state	population [capita]	area [km^2]	Pop. density [cap/km^2]	Local Administrative Unit - 1			Local Administrative Unit - 2		
				no. of units	mean pop. [capita]	mean area [km^2]	no. of units	mean pop. [capita]	mean area [km^2]
Austria	8 372 930	83 871	99,83	35	239 227	2 396,31	2 357	3 552	35,58
Belgium	10 827 512	30 528	354,67	44	246 080	693,82	589	18 383	51,83
Bulgaria	7 576 751	110 910	68,31	264	28 700	420,11	5 329	1 422	20,81
Cyprus	801 851	9 251	86,68	6	133 642	1 541,83	613	1 308	15,09
Czech Republic	**10 512 397**	**78 866**	**133,29**	**77**	**136 525**	**1 024,23**	**6 249**	**1 682**	**12,62**
Denmark	5 547 088	43 094	128,72	99	56 031	435,29	2 148	2 582	20,06
United Kingdom	62 041 708	244 820	253,42	443	140 049	552,64	10 664	5 818	22,96
Estonia	1 340 274	45 226	29,64	15	89 352	3 015,07	227	5 904	199,23
Finland	5 350 475	338 145	15,82	77	69 487	4 391,49	416	12 862	812,85
France	64 709 480	674 843	95,89	3 787	17 087	178,20	36 683	1 764	18,40
Greece	11 125 179	131 990	84,29	325	34 232	406,12	6 130	1 815	21,53
Netherlands	16 576 800	41 526	399,19	40	414 420	1 038,15	443	37 419	93,74
Ireland	4 450 878	70 273	63,34	34	130 908	2 066,85	3 441	1 293	20,42
Poland	**38 163 895**	**312 683**	**122,05**	**379**	**100 696**	**825,02**	**2 478**	**15 401**	**126,18**
Latvia	2 248 961	64 589	34,82	33	68 150	1 957,24	527	4 267	122,56
Lithuania	3 329 227	65 303	50,98	60	55 487	1 088,38	518	6 427	126,07
Luxembourg	502 207	2 586	194,20	-	-	-	116	4 329	22,29
Hungary	**10 013 628**	**93 030**	**107,64**	**168**	**59 605**	**553,75**	**3 152**	**3 177**	**29,51**
Malta	416 333	316	1317,51	6	69 389	52,67	68	6 123	4,65
Germany	81 757 595	357 050	228,98	1 457	56 114	245,06	12 379	6 605	28,84
Italy	60 397 353	301 318	200,44	107	564 461	2 816,06	8 101	7 456	37,20
Portugal	10 636 888	92 391	115,13	308	34 535	299,97	4 260	2 497	21,69
Romania	21 466 174	238 391	90,05	42	511 099	5 675,98	3 174	6 763	75,11
Spain	46 087 170	506 030	91,08	59	781 138	8 576,78	8 111	5 682	62,39
Sweden	9 347 899	449 964	20,77	21	445 138	21 426,86	290	32 234	1551,60
Slovakia	**5 424 057**	**49 037**	**110,61**	**79**	**68 659**	**620,72**	**2 928**	**1 852**	**16,75**
Slovenia	2 054 119	20 273	101,32	58	35 416	349,53	210	9 782	96,54
European Union	**501 078 829**	**4 456 304**	**112,44**	**8 023**	**62 455**	**555,44**	**121 601**	**4 121**	**36,65**
mean	18 558 475	165 048	112,44	309	60 142	537,84	4 504	4 121	36,65
median	9 347 899	83 871	101,32	69	79 419	924,63	2 478	5 682	29,51

As we can see from this table, Europe's administrative divisions are rather fragmented, particularly on the lowest level. It needs to be pointed out, though, that this fragmentation is rather uneven between the various member states. Particularly striking extremes may be recognised between France and Sweden, states of comparable geographic size, which nevertheless show a hundredfold difference in the lowest level of administration. Such extreme differences may be found between other states as well, which highlights the necessity of further coordination. Even from such rough and general data it is obvious that

representation, decision-making, economic and societal attitudes are different everywhere.

Administrative reforms have been carried out for various reasons in a large part of Europe. Nordic and Benelux states have initiated such changes from economic rationality, Southern states were eager to decentralise and regionalise their internal structures, and Central European states were keen to shed their structures from their single-party state heritage, which was fuelled by the prospect of structural and cohesion funds made available from the European Union.

For these reasons, some countries of the Visegrád Group have carried out administrative reforms, which were adapted to suit the new European reality. To counter the long-term effects of strong, centralised, single-party regimes, decentralisation rather than subsidiarity seemed to have been the main motif behind changes. The Czech Republic and Slovakia have thoroughly reformed their administration, Poland has carried out profound changes as well, whilst Hungary has remained less keen to reform its administrative structures, other than shifting rights and responsibilities from higher levels to lower ones. Whereas regions were created in Poland and lower-level administrative units were rationalised in Slovakia and the Czech Republic, Hungary has instead created statistical regions, but has not given them any self-government, nor has Hungary reformed its lower level administration, which means that fragmentation still prevails to this day. This could prove to be a great obstacle in effectively integrating the principles of sustainable development into other policies.

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USING RFID TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT SYSTEMS IN AVIATION

VYUŽITIE RFID TECHNOLÓGIE V SYSTÉMOCH RIADENIA DODÁVATEĽSKÉHO REŤAZCA V LETECTVE

Jozef GLOVA – Beáta GAVUROVÁ – Stanislav SZABO

Abstract
This paper describes in short way possibilities of RFID technology and reasons for transitioning to RFID technology from previous bar-code technology. The new RFID technology has also huge potential for improvements by using new and modern technologies in supply chain management. It enables especially to resolve tracking problems in more effective and faster way, and has resulted in significant economic, operational, technological, and logistical impacts on supply chain infrastructures. This technology has found out its implementation in avionics, whereby industry standards issues in avionics by the main industry players are actively addressing. The paper also gives an overview of the market trends for RFID technology.

Keywords: supply chain management, RFID technology, middleware

Abstrakt
Príspevok stručne popisuje možnosti využitia RFID technológie a dôvody vedúce k prechodu k tejto technológii z pôvodne rozšírenej technológie čiarového kódu. Táto nová technológia má obrovský potenciál pre vylepšenia týkajúce sa využitia nových a moderných technológií v oblasti riadenia dodávateľského reťazca. Predovšetkým umožňuje riešiť problematiku sledovateľnosti tovaru, alebo materiálu efektívnejšie a rýchlejšie, z čoho pramení významný ekonomický, prevádzkový, technologický a logistický dopad na infraštruktúru v dodávateľskom reťazci. Táto technológia rovnako nachádza svoje uplatnenie v oblasti letectva, kde sa problematikou odvetvového štandardu pre letectvo zaoberajú viaceré významné firmy tohto odvetvia. Publikácia rovnako poskytuje prehľad najvýznamnejších trendov pre tento trh RFID technológií.

Kľúčové slová: riadenie dodávateľského reťazca, RFID technológia, middleware

Introduction

One fast developing technology that creates visibility in the supply chain is radio frequency identification (RFID) technology. The strategic application of RFID technology to business problems and leveraging its data has the potential to optimize critical processes, enhance business intelligence, and improve collaboration across industries. The potentials of RFID technology are enormous and many industries can benefit from this technology.

Radio frequency identification technology (further RFID) has come of age. Recent years have seen a proliferation of RFID technologies and, more importantly, novel applications in areas from fine arts to manufacturing. Inventory tracking through RFID in a factory is now quite common. A quick scan of currently existing RFID solution and implementations reveals applications including pigeon flight monitoring, person identification, vehicle parking monitoring, valuable objects insurance identification, etc.

RFID is a generic term that is used to describe a system that transmits the identity in the form of a unique serial number of an object or person wirelessly, using radio waves. It is grouped under the broad category of automatic identification technologies. RFID technology does not require contact or line of sight for communication comparing to previous bar-code technology. RFID data can be read through the human body, clothing and non-metallic materials, what enable to resolve tracking problems in more effective and faster way, and naturally has also resulted in significant economic and technological impact on supply chain infrastructure in almost any industry in the national and global economics. Though the costs of the RFID tags have always relative low, it is reductions in the prices of RFID scanners (and in their sizes) that is beginning to see an increase in the number of new applications being found for these technologies.

1. Transitioning to RFID technology

The advantages of the RFID technology over bar-code technology and other automated data collection technologies are reliability in heavy moisture, noisy, or dirty environments, and greater flexibility in reading the tags in a wider scanning area.

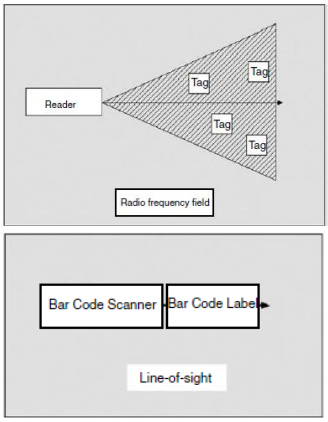

Figure 1 RFID versus bar-code technology
Source: own.

In contrast to RFID tags, bar-coded labels are pieces of paper with varying thicknesses of black lines. RFID readers and bar-code scanners read the tags or labels affixed to items in different ways. For instance a bar-code scanner reads information about a product, case, or pallet, while an RFID reader creates a radio-frequency field to activate multiple passive and active tags. Bar-code labels can only be read one at a time, whereas multiple RFID tags can be read all at once (e.g. 50 per second). See also Figure 1 on field areas.

The other useful features of radio frequency identification technology as compared to bar-code technology are as follow [7]:

- A reader can scan multiple tags, as many as 1000 at a time,
- The goods being scanned,
- The goods being scanned do not have to be manually oriented toward the reader for it to work,
- RFID radio frequency can usually penetrate an item's packaging and determine the contents,
- Tags embedded in the package cannot be scraped or rubbed off or damaged,
- Information on the tags can be written again to store further information,
- There is information flexibility, whereby information on the tags can change as the goods move across the supply chain network,
- Ability to read the data contained in the chip without line of sight.

There is a conflict in the supply chain arena between proponents who believe that RFID tags will replace barcoding - a technology of nearly 30 years - and opponents who believe that the investment does not provide a significant return on investment, given that barcodes are still much cheaper than tags. The main argument against the use of RFID is the current near-universal use of barcoding [7].

According to Poirier & McCollum [7], RFID technology can in generally provide:

- Inventory management and reductions,
- Greater visibility in the supply chain network,
- Potential to share useful data and collaborate with supply chain partners,
- Better production control through more accurate matching of supply and demand,
- Lower repair and maintenance cost,
- Improved data quality across many supply chain links.

There are also limitations, which could be summarized as follows:

- High costs, as compared to bar codes,
- The need to engage in process reengineering and restructuring,

- Limitation of RFID systems for global applications due to various frequency ranges,
- Lack of standardization,
- Interference from residual radio frequency sources,
- Interference with reading tags from environmental factors like metal and water.

2. General future market potential and potential application areas

There is huge potential of smart systems as can be seen in Figure 2, especially for the development of new services and applications which are not possible without the information and control trough sensors and actuators.

Although there is great prospective for future business opportunities, some challenges have also been identified in [3]:

- Making the business case to get management buy-in for investments.

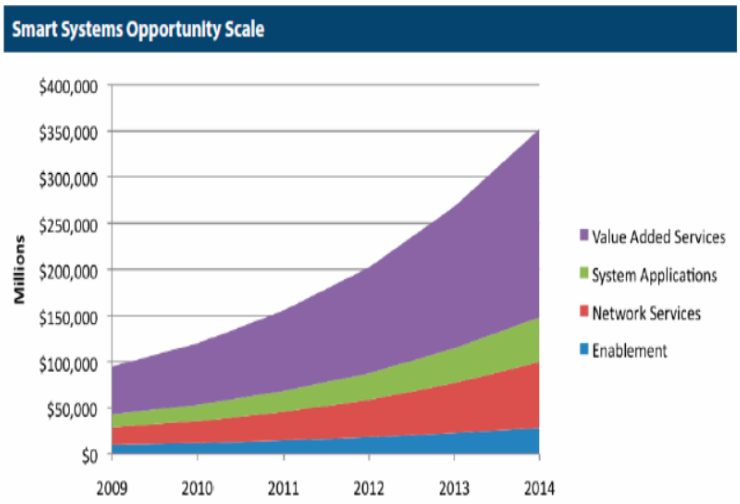

Figure 2 Opportunities for the IoT
Source: Harbor Research, Inc.

- Complex eco-systems require new ways for business to network.
- The anticipation and research of new product and service ideas.
- Fragmented vendor landscape for RFIDs, Smart Sensor Networks etc. that is not yet well aligned with larger IT infrastructure and players.

Despite the challenges, the analysts see the market for Internet of Things (further IoT) reaching a new level of maturity with a much greater recognition of technological capabilities and opportunities than two years ago. There should be a significant wave of growth in the IoT and the connection between physical and virtual world. This optimism is supported by observations of the following market forces [3]:

- The cost of devices continues to fall.
- In the meantime, at least in the developed countries, a ubiquitous broadband infrastructure has been developed.
- The monthly prices for cellular device links are being drastically reduced.
- The storage capacity and the processing power of computers continue to expand exponentially, which allows for new challenges in data management and data processing to be tackled.
- The continued miniaturization and the integration of a broad range of sensors into the edge nodes of the IoT.
- The continued evolvement of the Internet and of the next generation telecommunication network architecture that will allow the movement of very large amount of information.
- Simplified system interactions and better user interfaces, which have been reached through technology advances, are propelling adoption of new business models.

One additional predication in [3] is that end user participation in the design, development and management of the new technologies will increase during the next period of market development:

- End customers will put more emphasis on vertical solutions that integrate with enterprise systems.
- The demand for new features, innovations and adaptability will rise. If these needs are fulfilled, customers will fully integrate the new technology in their work and personal lives.
- The user experience will be an important topic. End users want to have systems tailored to their needs.

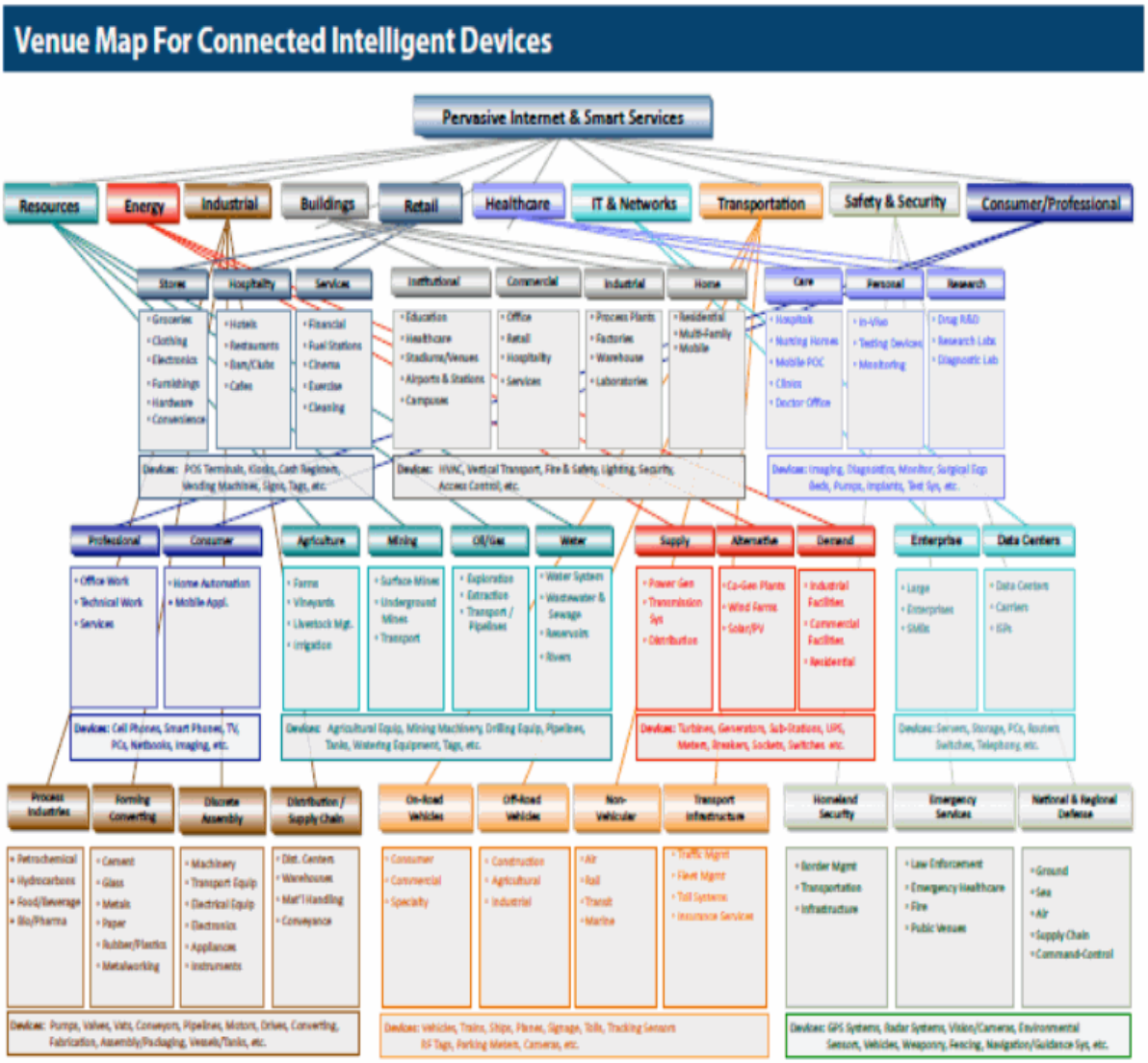

Figure 3 Overview over potential applications, Source: Harbor Research, Inc., see in detail: www.harborresearch.com/_literature_32583/Download_Brochure, page 4.

Over 300 specific services and machine types central to the future networked society have been identified. An overview is given in Figure 3 **Overview over potential applications, Source: Harbor Research, Inc**. where all these items are arranged into the ten main areas of buildings, energy, industrial, healthcare, retail, security, transportation, IT & networks, resources and consumer/professional [3].

3. Implementation of RFID technology in avionics

According to Holloway [4] the business environment in the avionics industry is set to see the following trends:

- Rising revenue growth from the launch of new aircrafts such as A380, A350 and B787, and the growth of low-cost airlines.

- Passenger demand is forecasted to double by 2020.
- Aerospace companies face competitive pressure to eliminate waste by creating corporate-wide lean enterprise programs.
- Industry investors want to see greater Return-On-Investment (ROI) from their R&D investments.
- Companies are increasingly collaborating on programmes.
- The need for strict safety has driven the industry to look at ways to uniquely identify parts and assemblies.

In light of the future trends, aerospace manufacturers need to improve their operations performance and effectiveness in areas such as control systems, tracking, quality, maintenance, and visibility. Furthermore, as aerospace companies outsource more of their manufacturing processes, there is greater need for real-time visibility, speed, and accuracy in dealing with demand fluctuations and supply chain disruptions. The ability to make right decisions on short notice to coordinate a complex array of activities among various partners is of great importance. This has a major influence on a company's productivity, profitability, and the ability to stay competitive [4].

Bearing in mind the challenges offered by the avionics industry and the need for companies to meet these challenges to stay competitive and profitable, we can see how RFID will aid companies in their objectives [7]:

- Improve airline configuration control,
- Reduce ownership costs of rogue parts (faulty aircraft components), helping to minimize airline inventories as well,
- Provide reliable part traceability,
- Reduce internal processing and cycle time,
- Enhance accuracy of information exchanged between manufacturers and suppliers.

4. Industry standards for RFID in avionics

The main industry player Airbus and Boeing are collaborating to establish joint industry-standards for RFID on commercial airplane parts. For instance in 2004, the two companies hosted a series of workshops and forums worldwide, inviting all the world's airlines, parts suppliers, regulatory agencies, and third-party maintenance shops, so that all of them can work together to establish common standards and enable technology that can benefit the whole industry. Both firms recognized the need for an industry standard for capturing data automatically based on the standardization of RFID in Air Transport Association (ATA) Spec2000. The Spec2000 is a comprehensive set of e-business specifications, products, and services for the aviation parts industry. [4] There needs to be an industry-wide commitment to invest in and integrate RFID into

the supply chain, otherwise, RFID technology would not be able to take off freely [5].

According to Airbus's official public document [1], Airbus is actively addressing the standardization issue as it leads the international standardization activities through participation at steering boards and industry conferences. Airbus also participates in the ATA Spec 2000 Chapter 9 Task Force, Permanent Bar Code Parts Identification and actively holds discussions with customers, suppliers and other aircraft manufacturers. Its main objectives are:

- Define harmonized identification information,
- Develop tag data standards,
- Define passive and active RFID usage in close cooperation with authorities,
- Develop an agreed standard for data exchange between different parties while considering existing aviation standards.

5. Market trends for RFID technology

Companies are now realizing the fact that the value of RFID is in the enablement of new business processes and not only the technology. Therefore, instead of only driving down the cost or compliance with a retailer mandate, innovation is becoming a key topic in the RFID market. Additionally, it becomes important for vendors to build complete solutions to targeted problems. At the moment, the applications needed to manage these new technologies are still missing. In the future, these newly developed applications will also be offered by business application suite vendors, such Oracle, Microsoft and SAP, as part of the life cycle of innovation. Other key trends according to [2].

- Asset management projects increase their importance as companies want to manage non-maintained or disposable assets.
- In the retail domain, in-store inventory management instead of supply chain inventory management is the focus of many projects.
- In general, the second wave of RFID adoption has begun which can be classified as exploration phase and is beyond initial pilot projects. Data is now collected through the pilots but now enterprises are thinking about intelligent ways to harness this large amount of new facts. Companies are using RFID to enhance their business competitiveness.

Factors which are contributing to these trends are globalization with the need to reduce the time-to-market and the combination of technologies for new applications, for example, RFID merged with GPS.

The analysts in [2] see the following key industries nearly in the phase, where a majority of the players have adopted the technology: healthcare, aerospace/defence and automotive. Furthermore, traceability and recall are

focus topics in pharmaceutical, retail and asset-intensive industries. The market for RFID technologies has a healthy growth trajectory as can be seen in Figure 4.

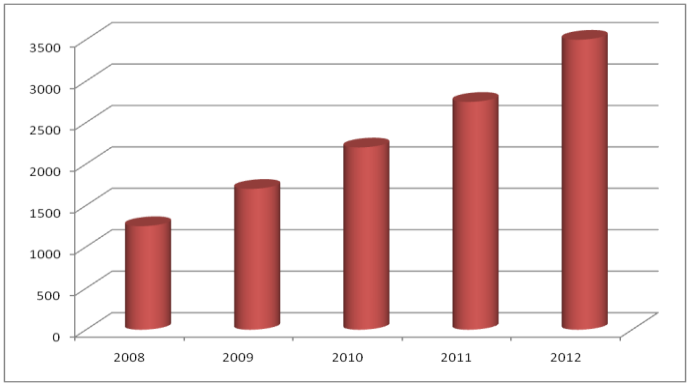

Figure 4: Total RFID Revenue in Millions of Dollars (Software and Hardware), 2008-2012, Source: Based on Gartner, 2008

RFID in Europe is still below the size and growth expectations of many within the industry. It is expected that high-volume RFID deployments increase only slowly in the region. However, Europe is heading for a significant upturn in RFID activity taking advantage of the latest tag and reader technology [2].

Conclusion

Radio frequency identification (RFID) is a seemingly simple technique. Data is stored in RFID tags that are attached to objects or located in smart cards, and this data can be read using radio signals and presented on a display by using a suitable reader. The data can then be transmitted automatically to an information technology system for further processing.

We describe possibilities of RFID technology concentrating on the transitioning from bar-code technology to RFID technology, as the new technology, which has also huge potential for improvements by using new and modern technologies in supply chain management. It enables especially to resolve tracking problems in more effective and faster way, and has resulted in significant economic, operational, technological, and logistical impacts on supply chain infrastructures. Our objective here is to examine RFID technology implementation in avionics, whereby industry standards issues in avionics by the main industry players are actively addressing. The paper also gives an overview of the market trends for RFID technology.

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RENEWABLE ENERGY SOURCES IN EUROPEAN COUNTRIES (USE IN TOURISM, GIS, GREEN BUILDINGS)

OBNOVITEĽNÉ ZDROJE ENERGIE V EURÓPSKYCH ŠTÁTOCH (VYUŽITIE V CESTOVNOM RUCHU, GIS, ZELENÝCH BUDOVÁCH)

Albína KOSTKOVÁ – Sergej STRÁJŇAK

Abstract
The article concerns renewable resources of energy (solar energy, wind power, hydro energy, biomass...) from the point of view of not so far future and the use of geographical information systems for the purpose of mapping the redeemable resources of energy. The human civilization is on the threshold of realising that the redeemable resources have their limitations and supplies of either oil or gas are spent to a great extent. The redeemable resources of energy have an excruciating (almost existential) impact on humanity for they can ensure further development and human progress. They will represent a motive force of nearly all state economies of individual states, for as much as after having been spent they will constitute the most important resources of energy.

Keywords: renewable energy sources, GIS, tourism, solar energy, water energy, green building

Abstrakt
Tento článok sa zaoberá obnoviteľnými zdrojmi energie (solárna energia, veterná energia, vodná energia, biomasa ...) z hľadiska nie tak vzdialenej budúcnosti a využitím geografických informačných systémov za účelom mapovania týchto zdrojov energie. Ľudská civilizácia je na prahu uvedomenia si, že zdroje energie sú obmedzené a zdroje ropy, alebo plynu sú vyčerpané vo veľkej miere. Obnoviteľné zdroje energie majú takmer existenciálny dopad na ľudstvo, pretože môžu zabezpečiť ďalší rozvoj a pokrok spoločnosti. Budú hybnou silou takmer všetkých štátnych ekonomík jednotlivých štátov a budú tvoriť najdôležitejšie zdroje energie.

Kľúčové slová: obnoviteľné zdroje energie, GIS, cestovný ruch, solárna energia, vodná energia, zelené budovy

Introducion

Renewable energy sources are of extreme, almost existential importance for humanity. Due to their nature, in a matter of few years they will present the driving force of almost all individual economies whereas once the fossil reserves come depleted they will become one of the most important sources of energy. Renewable energy sources (solar, wind, biomass…) are the way out to economical independence especially for the European countries that suffer from shortage of crude oil and natural gas. One of the most important advantages is attaining the energy so-called cost-free, when the initial investment includes installation of devices (solar collectors with solar energy, hydro power plants

with water energy, etc.). Once the necessary plants and devices are installed the energy collected for free, which is extremely important for the economy of any country and for individual households as well. Future and development of the entire humanity must focus upon, beside nuclear power, the energy that is being derived from renewable energy sources, whereas the crude cannot be drawn forever. In the 21st century, the geographic information systems present the means enabling mapping the renewable energy sources for general use.

1 Renewable energy sources

The European Union has, in its White paper of December 1995, suggested the following three key targets of the energy policy: increase of competitiveness, safe supplying and protection of the environment. Support of the renewable energy sources is being considered the most important element to meet the objectives. Proposed has been also a renewable energy sources strategy. The present 6% share of renewable energy sources in the overall energy production includes a wide range of hydro plants having highly restricted potential of further utilization for the EU. This means that it is necessary to enhance utilization of other renewable energy sources.

Table 1 Energetic benefits of renewable energy sources

year	**1990**	**1995**	**2010**
kind	Energy benefits (PJ)		
Solar energy	9	11	179
Wind energy	3	14	288
Geothermal energy	19	30	67
Vater energy	905	1105	1278
Biomasses	1100	1673	3968

source: (Rybár, Sasvári ; 2003)

Table 2 Renewable energy source

Renewable energy sources in Slovakia	**Overall potential**		**Technical potential**	
	TJ	GWh	TJ	GWh
Hydro energy	23 760	6600	23760	6600
Large hydro plants	20 160	5600	20 160	5600
Little hydro plants	3 600	1000	3600	1000
Biomass	120 300	33 400	120 300	33 400
Forest biomass	16 900	4700	16900	4700
Agricultural biomass	28 600	7950	28 600	7950
Bio – fuels	7000	1950	7000	1950
Bio – gas	6900	1900	6900	1900
Other biomasses	60 900	16 900	60 900	16 900
Wind energy			2160	600
Geothermal energy	174 640	48 500	22 680	6300
Solar energy	194 537 000	54 038 000	34000	9450

source: (Gečová & Popovičová; 2011)

1.1 Solar energy

Sun is the permanent and principal source of energy radiation within the solar system. The energy source of this star derives from transformation of hydrogen into helium by thermonuclear reactions taking place in the center of the sun. Solar radiation covers the distance between the Earth and Sun (some 150 million kilometers) in 8 minutes. One two-billionth of the radiated energy arrives to the Earth. This is the energy of 174000 TW, whilst the current overall energy consumption does not exceed 10 TW globally (Rybár et al; 2010).

The Sun is emitting solar radiation in the entire range of the spectrum from the minutest wavelengths (roentgen and UV radiation) up to radio-wavelength radiation. When passing the atmosphere, a part of the radiation is absorbed with it (19%). A part of the radiation (34%) rebounds from the clouds, i.e. molecules of gasses, and returns to the planetary space as a part of the Earth radiation. Remaining radiation (47%) returns to surface of the Earth. (Cihelka; 1994)

When hitting the Earth, the solar radiation transforms to heat and chemical energy. Major part of the energy is involved in the hydrologic cycle and the rest forms winds, surfs, marine streams and is responsible for photosynthesis (Rybár et al; 2010).

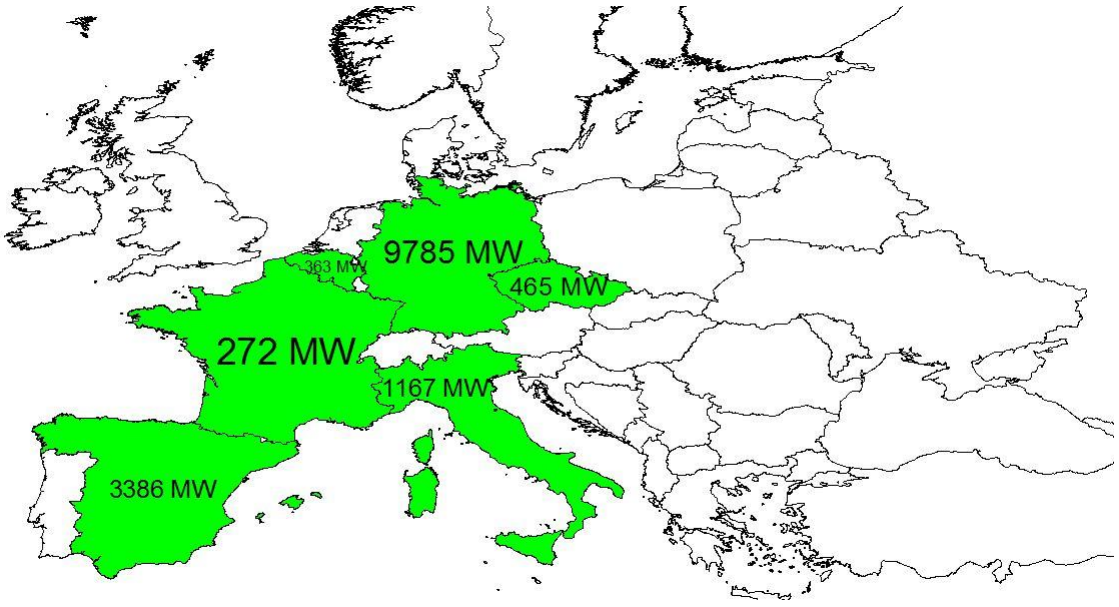

Figure 1 European countries most extensively utilizing the solar energy

Solar energy utilization

Distinguished can be three basic ways in which is the solar energy utilized:

- **Passive solar energy**, when the shape and construction of buildings is designed so that the incoming radiation, its storing and distribution of heat were as effective as possible;
- **Active solar energy** – collectors for heating of both water and interiors or parabolic mirrors and other systems that concentrate solar radiation.
- **Photovoltaic panels** – producing electricity directly from the solar radiation (Rybár et al; 2010)

Utilization of solar energy in Slovakia

Witnessed in the recent years can be an accelerated growth in the number of solar collectors utilized in Slovakia, installed especially to heat up water and to heat up interiors of family houses. Whereas the price of turnkey installing of solar collectors fell in the matter of several past years collectors became more affordable for a wide spectrum of the population. From the point of continuous growth of the gas prices, whilst households for heating still most frequently use the gas, the solar energy seems to become the major substitute of natural gas (especially in the south Slovakia and the Tatras regions where the sun rays impact most intensely) (Janíšek; 2007).

1.2 Geothermal energy

The energy derives from two sources: from radioactive decay within the crust of the Earth and from the heat penetrating from the earth core through the Earth's crust. The Earth core is hot whereas the Earth was hot in the past and is continuously getting more and more cold and solid. A source of heat within the Earth's core is also friction occurring in tidal forces: the Earth expands due to action of the gravitational forces of the Moon and Sun same as varying is the shape of an orange when squeezed and rolled by hands. Utilization of geothermal energy is highly tempting whereas it is always "at disposal" regardless of the weather; if we'd built geothermal power plants they could be turned on and off as and when necessary. (Mackay; 2009).

Geothermal energy, as an alternative source of energy, may currently bring about savings in conventional fuels at simultaneously high appreciation of the electric power. Max utilization of the geothermal water is seen in combinations of the primary utilization of geothermal waters (e.g. for heating) with secondary utilization, i.e. by transformation using thermal pumps to attain a higher but still usable thermal level, and thus by successive decreasing the geothermal water temperatures to 5 deg. C. (Franko; 1986).

Temperature of rocks depends on the amount of heat making it from the depths of the Earth and on the thermal conductivity of the rocks. Geothermal energy is utilized through its vehicles – geothermal waters and steams. The most chronically known and clearly observable effect of this energy is the volcanic

activity that has a connection with the Earth's crust mobile zones. Other clearly visible effects of the geothermal energy are discharges of steams, geysers and hot water springs, and these are connected with the ditto zones as well (Sasvári & Rybár, 2003).

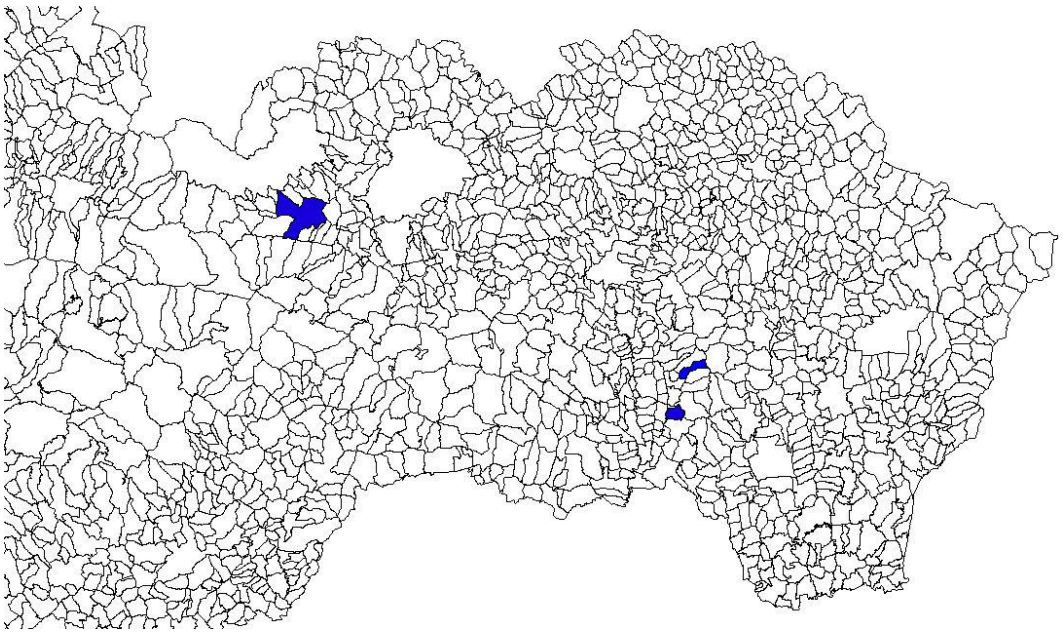

Figure 2 Gheotermal localities in the East Slovakia

Extraction of geothermal energy

At "higher efficiency geothermal extraction" from dry hot rocks drilled by use of water jets to break the rock are openings 5 km or 10 km deep. Drilled next is another well penetrating into the point of fault. Subsequently, water is being forced down one well and when heated it is pumped out through the other one. Next, the water can used to produce electricity or heat (Mackay; 2009).

1.3 Wind energy

Natives were utilizing the energy of wind to propel their ships more than 5,000 years ago when sailing along Nile in Egypt. The first records proving utilizing windmills were found in Persia, from roughly 200 A.D. Windmills were widely used from the Middle Ages till the beginning of the 20th century. At the beginning of the 21st century wind propelled rotors begun to be utilized for production of electricity. Currently, adjusted wind devices produce significant volumes of electricity mainly in the U.S. and, to a lesser extent, wind energy is being utilized also across Europe. At wind force below 3 m.s^{1} its power is so low that it is technically unusable. For production of electricity the optimal wind force is 12 m.s^{1} and when the wind force exceeds 25 m.s^{1} the wind plant must me shut down to prevent its damage. (Rybár et al; 2011).

Movement of air producing forces

Airflow in the atmosphere is to a significant extent given by distribution of pressures. The wind blows in the pressure drop direction. Pressure difference between two points, received by a unit of distance in the direction of most profound drop determines the horizontal pressure gradient Fg. Considered for the unit of distance is 111 km, which corresponds with 1° of the meridian. The air movement direction would be determined solely by the effect of the horizontal pressure gradient only if it would be assessed in relation to a stationary system of coordinates. But, revolving of the Earth along the vertical axis exerts deviation or so-called Coriolis force that is acting upon direction of the contemplated air particle and brings about change in its direction to the right on the northern hemisphere and to the left on the southern hemisphere (Bielek, Černík, Tajmír; 1989).

Wind force

Wind force is the most important parameter influencing the volume of energy a turbine is capable of producing. Rising wind force means higher volumes of air in a unit of time flowing through the plane given by the rotor, and hence higher density of the wind power. Thus, wind force grows by the third power of the wind force (Rybár, Kudelas, Fischer; 2003).

Wind energy storing

Electric energy can be stored in batteries after employing converters of D.C. to A.C. It is obvious that it necessary to take into account some losses arising of the way the energy storing is administered. Another form of storing is to store the energy in form of heat – in insulated liquids holding tanks (Rybár et al; 2011).

Wind energy in the E.U.

According to the statistics of the Global Wind Energy Council (GWEC) the overall power of wind turbines installed within the E.U. amounted collectively to 75 GW in 2009. It is recorded that in the very year 2009 installed were 10 GW. For comparison, the overall installed capacity in 2000 amounted to 10 GW. Wind turbines are nowadays satisfying some 4.2 percent of the EU electric energy demand. Based on the GWEC statistics, annually eliminated thus are c.a. 108 million tons of CO_2 emissions (Janíšek; 2007).

Table 3

Wind force	Speed in m.s-1	description	Visible action
0	0-0,2	calm	Calm. Smoke rises vertically
1	0,3-1,5	Light air	Smoke drift indicates wind direction
2	1,6-3,3	Light breeze	Leaves rustle and wind vanes begin to move
3	3,4-5,4	Gentle breeze	Leaves and small twigs constantly moving
4	5,5-7,9	Moderate breeze	Dust and loose paper raised
5	8,0-10,7	Fresh breeze	Branches of a moderate size move
6	10,8-13,8	Strong breeze	Large branches in motion
7	13,9-17,1	High wind	Whole trees in motion
8	17,2-20,7	Fresh gale	Some twigs broken from trees
9	20,8-24,4	Strong gale	Minor damages due to wind
10	24,5-28,4	Storm	Extensive damages
11	28,5-32,6	Violent storm	Widespread damage
12	32,7-36,9	Hurricane	Fortunately, not experienced in the inlands

source: (Rybár, Kudelas, Fischer; 2004)

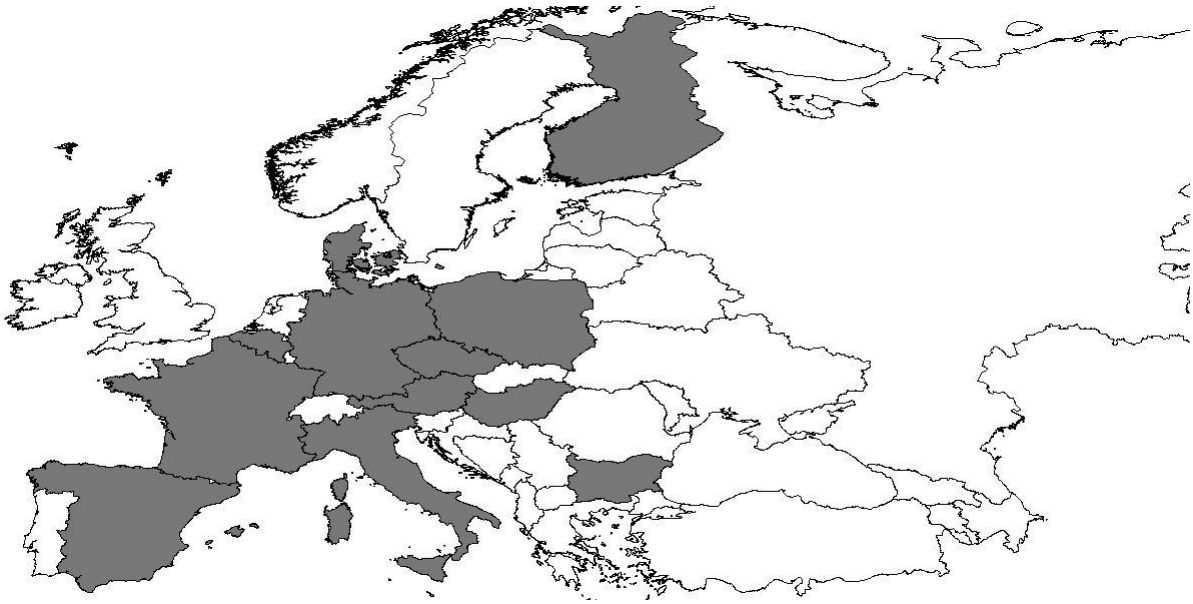

Figure 3 European countries most extensively utilizing the solar energy

1.4 Biomass

Biomass in the form of plants is chemically preserved solar energy. It is simultaneously one of the most universal and the most spread sources of energy on the Earth. Plant biomass is a result of photosynthesis. Photosynthesis is the unique process on the Earth, the result of which is production of an organic substance and oxygen by means of the solar energy and its change for energy of chemical bonds. Directives 2001/77/ES define biomass as a biologically decayed fraction of a product, waste and the rest of crop and animal substance or as a biologically decayed component of industrial waste including lye of processing wood and communal waste (Lieskovský et al; 2009).

Table 4 Coniferous wood used for biomass

	2000		**2001**		**2002**		**2003**		**2004**		**2005**		**2006**	
Coniferous wood	m3	%	m3	%	m3	%	m3	%	m3	%	m3	%	m3	%
Cutting out 1st class	1,402	0,05	5,916	0,21	3,153	0,11	2,604	0,08	1,078	0,03	0,216	0,05	0,307	0,06
Cutting out 2nd class	17,34	0,6	24,59	0,8	25,01	0,8	18,44	0,5	17,35	0,4	5,36	0,11	8,94	0,18
Cutting out 3rd class	1595	55,19	1420	51,4	1578	54,7	1765	52,3	2199	54,5	2387	50,5	2922	61,1
Mining wood	14,74	0,51	22,01	0,8	16,37	0,57	18,3	0,54	30,04	0,74	13,02	0,27	14,52	0,303
Poles	9,972	0,34	20,8	0,8	11,2	0,4	11,24	0,33	14,1	0,35	56,9	1,2	13,07	0,27
Fibrous wood	1097	37,93	926,1	33,6	1040	36,1	1259	37,3	1337	33,1	1041	22,1	1017	21,3
Forest split logs	_	_	4,387	0,16	1,27	0,04	1,8	0,05	3,722	0,09	11,53	0,244	69,28	1,45
Fuel wood	118	4,08	123	4,5	133,6	4,63	161,4	4,78	155,4	3,85	103,3	2,18	142,5	3
Stem wood	27,04	0,94	72,12	2,6	34,51	1,2	50	1,5	86,15	2,1	585,7	12,4	308,8	6,45
Raw trunk wood	4,77	0,16	138,6	5,02	39,1	1,36	76,64	2,27	187,9	4,66	500,6	10,62	287,2	6

Source: Lieskovský et al; 2009)

Chemical structure of biomass

Although chemical structure of biomass differs among single plant species, on average plant contains approximately 25% of lignin and 75% of

hydrocarbons or saccharides. Hydrocarbon component consists of a lot of saccharide molecules joined into long polymer chains (Gečová & Popovičová; 2011).

Process of biomass formation

The plants use carbon dioxide for their growing from the atmosphere and water from the soil and those thanks to photiosynthesis are changed into hydrocarbons- building elements of biomass. The energy stored in chemical chains is gained again by burning of biomass. Oxygen from the air is bound with carbon in the plant. A result of this process is a formation of carbon dioxid and water. This process is cyclically closed and carbon dioxide which was originated is the initial substance for a new biomass (Gečová & Popovičová; 2011).

Biomass as a source of heat

Using of wood for heating is quite simple, with a long tradition and no expensive and complicated technologies. The advantage of biomass is a low sulphur contents and sulphur dioxide in combustion products (it is only a fraction compared with soft coal). Just as heavy metals are usually contained only in negligible quantity and to a large extent it depends on the soil where biomass grew and what plants are its components. Practically any form of biomass can be burnt but some conditions must be accomplished- e.g. acceptable extent of humidity, suitable size and form. Naturally the fact that technically any form of biomass can be burnt does not mean yet that it is economical and advantageous. E.g. the seeds of oil plants have excellent calorific value and certainly it would not be any big problem to adjust the boilers to pallets for their burning, but more advantageous would be to press the oil from them and to change it into the fuel for car engines (Murtinger, Beranovsky; 2011).

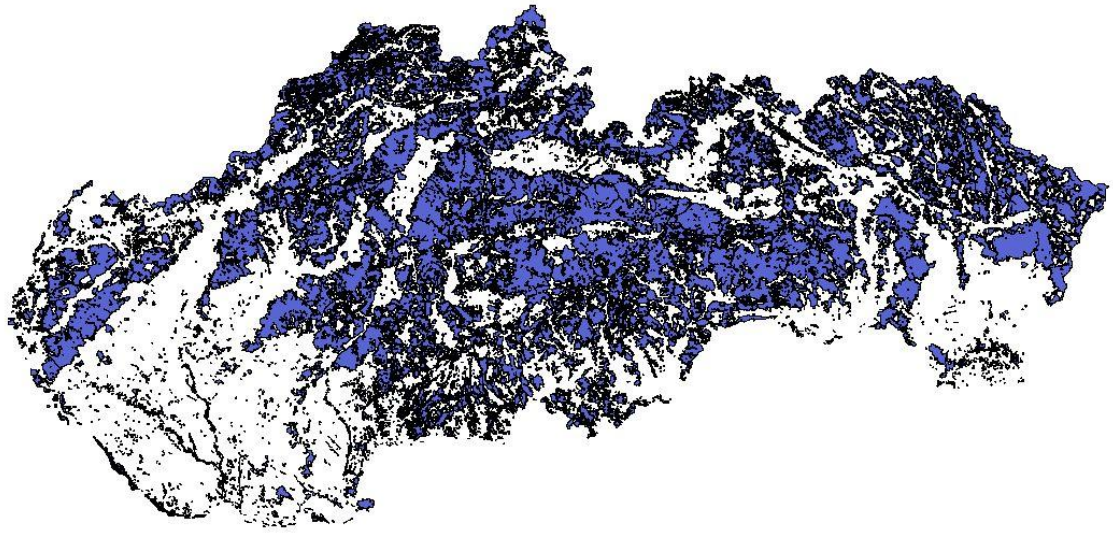

Figure 4 The most ideal localities for production of biomass in Slovakia

Rapidly growing woody plants and ways for their utilization

Rapidly growing and high production woody plants, their cultivars and clones can be grown by means of intensive methods when setting up and cultivating forest covers. Higher and faster wood production will be achieved. Cultivating of rapidly growing woody plants can be guaranteed by the form of lignicultures and intensive cultures of poplars and willow trees for production of round timber and fibrous ranges, raw wood and energy wood as well. In our country the biggest meaning have following sorts of economic woody plants: poplars, willow trees, white locusts, alders (Lieskovský et al; 2009).

Table 5 Combustion heat and calorific value

Woody plant	Combustion heat [MJ.kg-1]	Caloric value [MJ.kg-1]	Water [MJ.kg-1]	Ash [MJ.kg-1]
ALDER	19,3	15,8	10,6	0,88
Pine	20,3	16,5	11,1	0,41
Birch	19,7	14,5	18,3	1,91
Beech	19,1	15,0	13,6	0,44
Spruce	20,1	16,4	11,0	0,47
Poplar	19,7	16,2	10,2	1,64
Willow	19,5	16,1	10,0	1,50

source: Skála, Ochodek; 2007)

Recently development of logging and delivery structure of raw wood sorts proves a rising trend which is a result of partially rising demand for raw wood (until 2006 year) and significantly a bigger intensity and size of random logging

influencing a wood market and that with wood products. In the end the global economic crisis and a reduction of demand for wood and wood produsts cause a fall of several wood processing firms. In spite of this fact it can be supposed that with gradual decrease of fosill fuels and rising energy demands, demand for wood- renewable source will rise gradually and its price will be higher. In future wood and biomass become inevitable part of the strategy of individual states (Lieskovský et al; 2009).

Biogas

Various initial materials can be used for production of biogas e.g. livestock excrements, maize silage, green matter, kitchen waste, processing plant waste, cellulose waste and their mutual combinations (Maga et al;2008).

Table 6

Livestock	**Excrement production in kg, piece-1, day- 1**	**Excrement production in kg, piece- 1, day- 1**
Cattle	50,3	18100
Pigs	4,35	1580
Poultry	0,18	60

Source: (Maga et al;2008)

1.5 Water energy

Water energy is a classical case of renewable sources of energy and its utilization often brings other positive influences on the enviroment and landscape. Water in the nature includes a kinetic energy of water course. The movement of surface water is a link in a chain of a big water circulation on the Earth. The source of this circulation is a solar energy, that is why water energy course belongs to pernamently renewable energy sources. The effect of a heat causes vaporization of water from the ocean and sea surfaces and mainland as well (Boleman, Fiala; 2009).

The water potential energy at any place is given by two quantities: amount of water overflowing for a time unit and a vertical height of a water speed. The water speed can be naturally or a artificially made e.g. by a dam. The formula computation of a theoretical hydropotential is:

$P=p.g.Q.H$

p= water density

g= gravitational constant

Q= flow rate

H= height of water

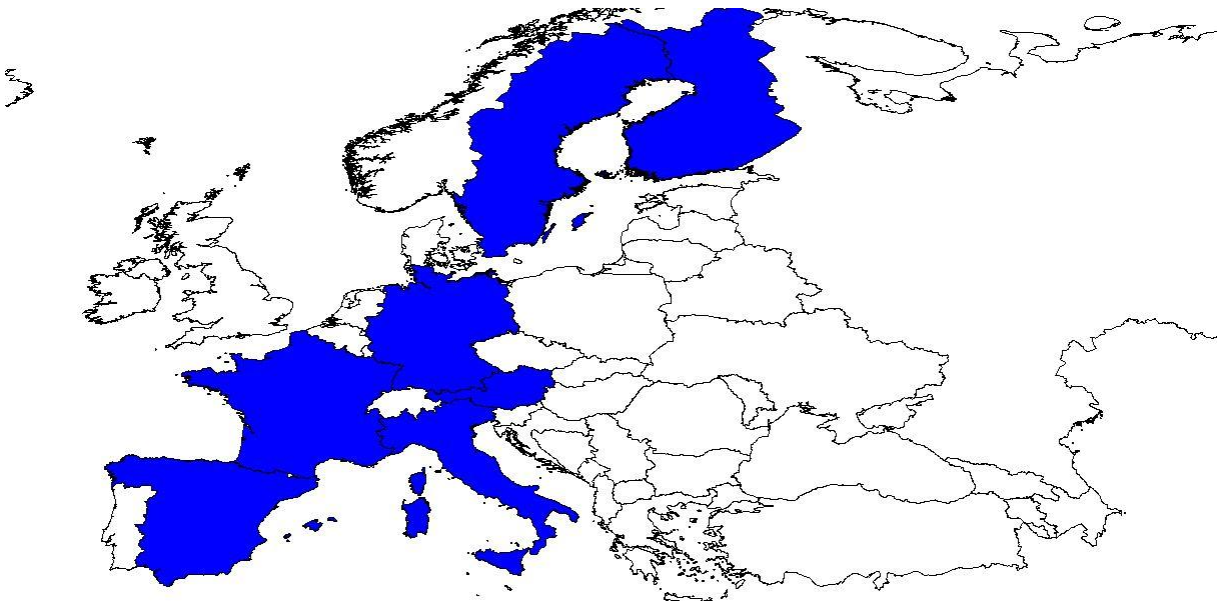

Figure 5 European states with the biggest utilization of water energy

A water energy in2006 year had an installed power 843 GW- the production of big water power stations was 770 GW and small ones produced 73 GW. Huge water power stations represent 15% of the world electricity production. Technically usable hydroenergy potential of Slovakia represents 7361 GWh/year of energy and at present it is used 243 GWh/year. Small water power stations produced 250 GWh of the electric energy (Boleman, Fiala; 2009).

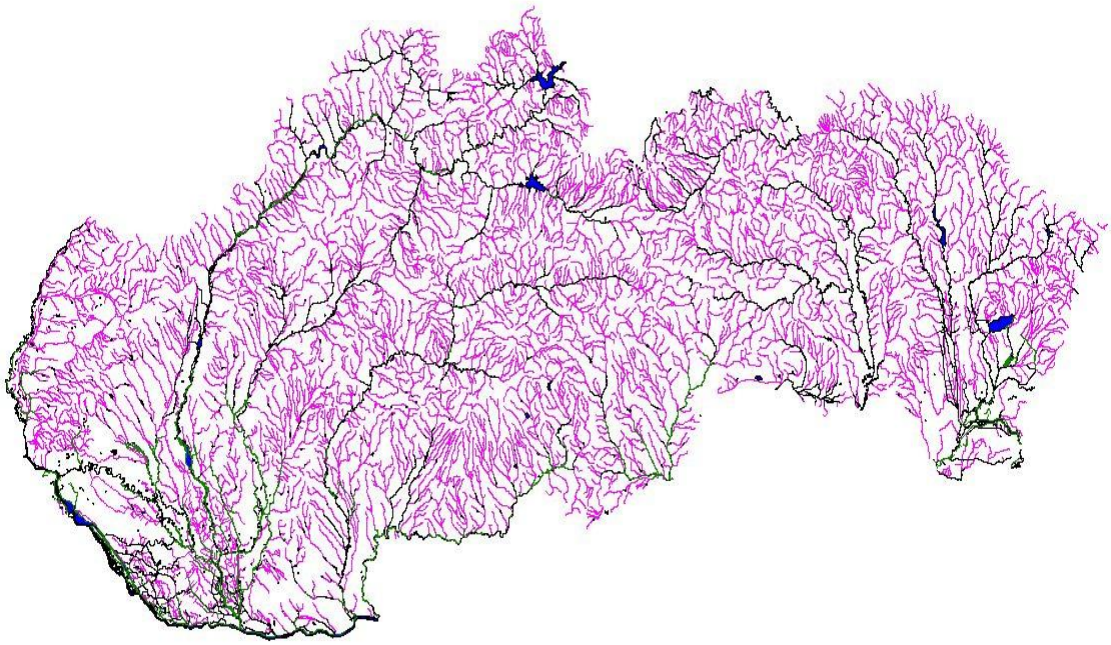

Figure 6 The Slovak river net

2 The utilization of renewable sources of energy in practice

Index of sustainable society

Sustainable development is a topic discussion in those days- the great importance is to attach this problem, but it is very difficult to speak about it. We can meet the definition of the Brundtland´s board which is supported by the index of the sustainable society, SSI made by the Fund for the sustainable society in 2006. The sustainable society can be defined as a society:

- which satisfies the needs of a present generation without threatening of the future generation
- in which each person has got conditions for the free development in a balanced society (Farkašová; 2010).

Green buildings

The green buildings are effective in using of energy, natural and social sources which are friendly to the environment during their whole life cycle - i.e. on a project and the choice of the land, during of a process building until the renovation or liquidation. The main role as for the projects and buildings play the economic and ecologic facts- the quality and friendliness to the outside community. The main aim of "green buildings" is to minimalize the negative impact for the people health and the environment i.e. - effective using of energy, water and other natural sources, the protection of the users health in these buildings and increasing of the employee´s production, limitating of waste, pollution and degradation of the environment (www.skgbc.org.).

High effective windows, ceiling, floor and walling isolations can be used for a rising of energy effectiveness of the building shell (binds between the heated and non- heated space). Another way is a passive solar architecture – it can be seen in so- called low- energy houses. A project architect´s orientation of windows, walls, roller blinds for the shading of the buildings is very important, summer gardens and trees around the house as well for making a shade in hot days (the heating is not needed) and in winter the solar energy must be maximized into the living space. The appropriately chosen position of Windows reduces the consumption of the energy for a lighting in a day by maximal using of daylight in the building. Production of the energy right in the centre of a building by means of renewable sources of the energy- solar energy, wind energy, low- potential energy of the environmental energy (the thermal pumps) and biomass decrease the impact on the environment, save the costs and increase the energy sufficiency) (http://stavba-dom.sk/articles/stavba/co-su-to-vlastne-zelene-stavby).

The economic return of green buildings with the use of renewable energy sources

The higher front- end expenses for green buildings come back to the owners thanks to their energy effectiveness and a positive influence on health, productivity of employees and students and the well- being of the tenants. Studies and examples of the practice over the last 20 years show that the effective design and the construction of green buildings can be achieved at the minimal expenses (about 2%, in some cases even without increasing of expenses by more effective using of sources and the environment), savings are quite considerable. Shortsightness, of course, does not play off. Planning and design, knowledge of affordable possibilities and guarantee of a high building quality play the most important role. The most modern technologies are the superstructure which can bring additional saving during the life cycle of the building. (www.skgbc.org).

According to the trend of green buildings in Europe it is supposed that about 20% of buildings in the EU will be built of renewable sources of the energy.

The most outstanding green buildings in Slovakia are:

- The Aquacity Poprad
- The industrial park airport Košice is still under the construction

Planned green buildings in Košice

It will be the newest Office centre that started to be built in the certificate DGNB (DAS GűTESIEGEL NACHHALTIGES BAUEN) and it will be built in 2012.

Figure 6 EcoPoint Office Center (design by EcoPoint s.r.o.)

Using renewable energy sources in tourism

Sicily

From 1946, **Sicily** is an autonomous region of Italy and the biggest Mediterranean island (a surface of 25,799km^2 and a local population of 5,100,000), situated in the southern part of Italy. Its economy is based mainly on agriculture, fishing, industries and tourism. During 1970s the island has suffered from the immigration of a large part of its population towards United States and Europe and therefore today's Sicilian economy is not largely facilitated from local investments and entrepreneurship. Therefore, the island suffers an unemployment rate of 20% and a lack of specialized professionals. From an energy point of view, 70% of electricity feeding is coming from fossil fuels and the 30% from renewable energies (mainly from hydroelectric plants). Nevertheless, the potential of renewable energies remains high, mainly for geothermy and thanks to the volcano Etna which is the largest volcano in Europe. This is why, in this island, full of areas characterized as UNESCO's natural heritages, an innovative energy system has been undertaken and is worthwhile to be discussed: A system of electricity produced from waves is tested in the Messina Strait since water density (and therefore energy production potential) is 800 times bigger that the one of wind, and energy coming from waves can be perfectly predicted (contrary to wind energy). For the moment, results are very encouraging and the system is considered to be even more profitable than the wind energy installations (Evanthie ; 2008).

Cyprus is an island near Turkey, Syria and Lebanon which hosts today 820,000 people and covers and area of 9,251km^2. The island suffers from geopolitical problems, as in 1974 there was a Turkish armed invasion in its territories, resulting at the occupation of a strategically important part of the island. Through accession to the European Union in 2004, the Cypriot Republic benefits from the financial and legislative European support towards a sustainable energy management. Its intense geomorphologic elements, climate, local natural sources and local acceptance towards the introduction of new energy forms vary depending on the region. This is exactly why different energy local plans have been elaborated and different energy technologies have been proposed. In areas for example with fragile ecosystems and historical monuments, some interventions were chosen which would not create optical perturbances. In areas of luxury tourism attraction the idea of the use of solar vehicles in the golf terrains were launched, whereas in remote areas the combustion from biomass was promoted for the domestic use (Evanthie ; 2008).

The thermal pumps in the recreation- touristic centers and the swimming pools

The exceptional position in the recreation- touristic centers have got the swimming pools which except possibilities for recreation provide a healthy physical and mental development mainly for a young generation. The prolongation of the swimming season in our conditions can be reached by the temperate rising of water temperature in the pools- about 5-10 degrees. Intensive waste thermal sources from the swimming pools sites with a thermal level of 20-30 °C enable using of the thermal pumps for warming up of water in the pools effectively (water supply with a temperature 35- 40°C) (Petráš et al; 2001).

3 Research survey results of using the renewable sources of the energy in the households

For the better illustration of our households attitude as for using of the renewabla energy sources the questionnaire was made. The survey was realized from 15th September to 25th September 2011 and 100 families living in the houses were chosen as a sample. The Questionnaire was distributed via the social net Facebook. The result of this survey was not quite positive- only a few families use the renewable sources of energy (i.e. the solar energy and biomass). But we can suppose that in the future using of the solar energy will rise in a form of the solar collectors for water heating.

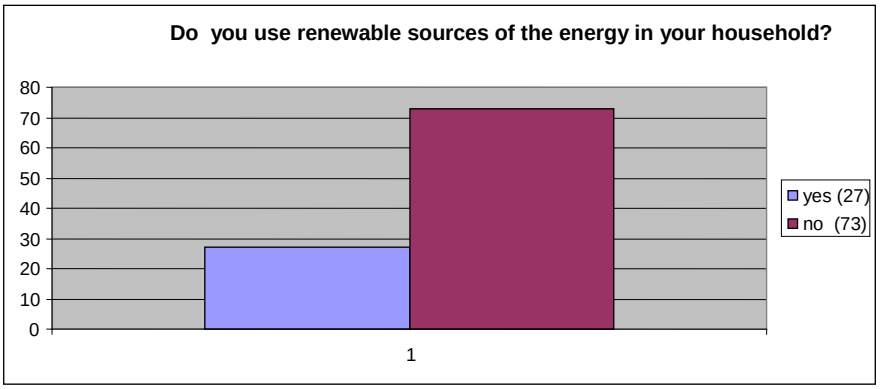

Figure 7 Using of the renewable sources of the energy in the households
Source: produced by authors

It can be said that the survey revealed that about ¼ of families (27%) uses the renewable sources of the energy, but from the point of view of the importance of using the renewable sources of the energy. The all households agreed that it would be good to involve people to use these sources in the future. 45 households from 75 (still unconnected) signed the agreement with the integration of using renewable sources of the energy.

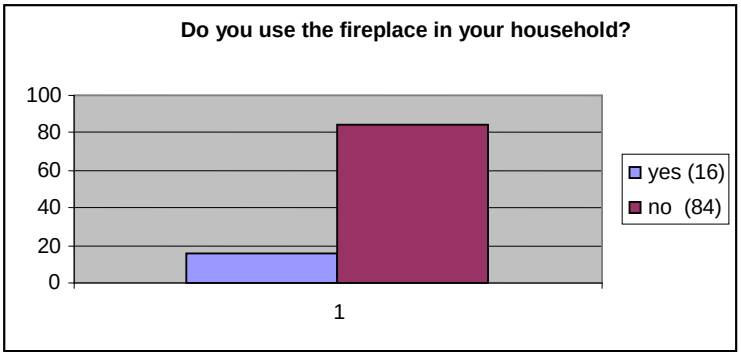

Figure 8 Using of the fireplace in the household
Source: produced by authors

It was found out that only 16% of the households use the fireplace for heating. But because of price rising of gas for warming of water and heating more than 50% of the households think about using of the fireplace.

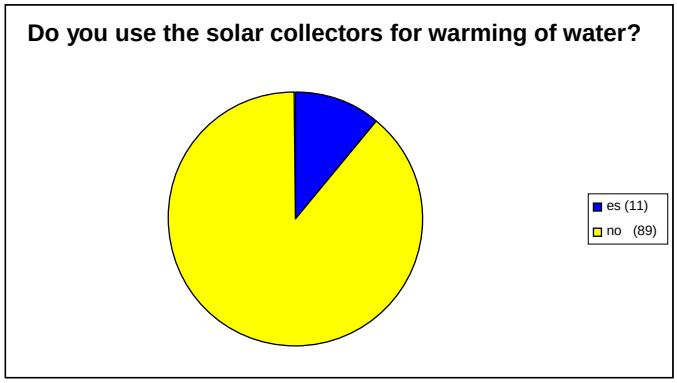

Figure 9 Do you use the solar collectors for warming of water
Source: produced by authors

The survey found out that knowledge of using of this kind of the energy is quite high in a single households because nearly half of asked people say that they are going to use the solar collectors for heating of water. The obstacle is the high expense for buying such solar collectors.

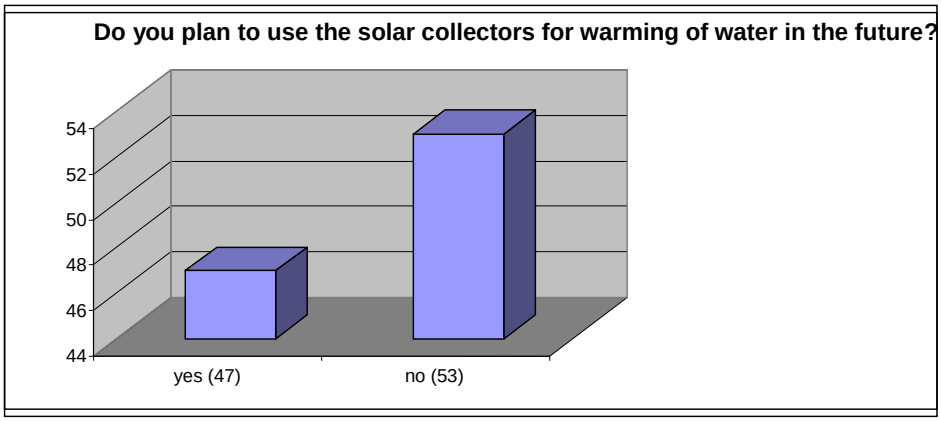

Figure 10 using of the solar collectors in the future
Source: produced by authors

The results of our survey present exact opinions of the households in our region as for using of renewable sources of the energy.

Conclusion

The renewable sources of the energy start to represent irreplaceable mean for moving ahead of mankind. The states which do not dispose of the big amount of oil and gas (most states of the EU) must be orientated in future on using of renewable Earth sources such as biofuels, the solar energy, wind and water energies to be self- sufficient. In this contribution we tried to say more about renewable sources of energy together with using of geographic informational systems and to record them into the maps. It is clear that in the future the renewable Earth sources will represent one of the main forms of using of the energy for a human progress. We can see a rising of using of the renewable sources of the energy every year. Except these problems we mentioned the practical using of the renewable sources of the energy mainly "green buildings" e.g. Aquacity in Poprad and industrial park near Košice which is finished at present. It depends on us when we understand that oil and gas represent the Earth sources which are unfortunately exhausted and in future it is needed to use more the solar energy, biofuels etc.

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SOCIAL ENTREPRENEURSHIP AND SOCIAL ENTERPRISES WITHIN THE SLOVAK LABOUR MARKET

SOCIÁLNE PODNIKANIE A SOCIÁLNE PODNIKY NA SLOVENSKOM TRHU PRÁCE

Lýdia HALAGOVÁ – Lenka PELEGRINOVÁ

Abstract
Social enterprises represent a new phenomenon on the Slovak market, even they are well known in other European countries. The European Union supports initiatives of social entrepreneurship already within the last two framework programmes, but it emerged in the Slovak labour market only three years ago. Thus authors deal with specific features of social entrepreneurship and social enterprises within Slovak regions. The aim of the article is to identify social enterprises in Slovak regions and then present a draft typology of social enterprises appropriate for conditions of the Slovak market.

Keywords: enterprise, WISE, social economics, social enterprises, social entrepreneurship

Abstrakt
Sociálne podniky predstavujú na Slovensku nový fenomén, napriek tomu, že Európska únia podporuje iniciatívy sociálneho podnikania už druhým rámcovým programom. Autori sa preto sústredia na špecifiká sociálneho podnikania a sociálnych podnikov na Slovensku. Cieľom príspevku bude identifikovať sociálne podniky na Slovensku a navrhnúť typológiu sociálnych podnikov vhodnú pre podmienky slovenského trhu.

Kľúčové slová: podnik, WISE, sociálna ekonomika, sociálne podniky, sociálne podnikanie

Introduction

While in the world the terms like "social economy", "social enterprises" and "social entrepreneurship" are already known, in Slovakia and neighbouring countries had these concepts appeared only in the last three years. They are under the influence of international institutions and take experience from abroad. Activities running within the social economy are realized through the initiative EQUAL of the European Social Fund, whose activities are covered by the Ministry of Labour, Social Affairs and Family of the Slovak Republic (MLSAaF). Projects under the initiative EQUAL have been also implemented by Slovak NGOs.

After the 2006 election had the concept of social enterprise appeared as a part of the programme of the Government of the SR. Even this term is so far unexplained it led to a great interest and opened a discussion, where

participant's debate began to look for inspiration abroad. Currently, the social economy has a tendency to develop and find its application also in Slovakia in various areas of its operation. Given the efforts of the European Union to enforce the resolution in the member countries, it is evident that this process will certainly continue.

In the presented article authors address the issue of social entrepreneurship and social enterprise in Slovakia, together with the new typology of social enterprises. This approach can be inspiring for the development of social entrepreneurship in the country.

1. Definition of Enterprises and Entrepreneurship

The basic business entity in a market economy is an ***enterprise*** that enters into mutual interactions with their surroundings. The result of his business activities are products and services. (MALEJČÍK, 2008) The Commercial Code defines a business as a set of tangible and intangible personal and business components.

When we talk about business, *management theories in developed countries define* entrepreneurship as a human feature and his craft to innovate, motivate, develop and exploit opportunities to develop production and economic activity, to increase the prosperity of the business entity. They distinguish business as:

- business (enterprise) - in terms of production, processing and value-added brokerage;
- business (business) - in terms of trade - targeted and profitable activities (MAGULA, 2007).

First author to introduce the term entrepreneurship into the business literature was Richard Cantillon. Particular attention is paid to entrepreneurship in economic theory after the turn of the 19th and 20 century in the work of Schumpeter and Knight. (EuroEkonóm, 2009) *Modern theory of entrepreneurship* (I.M. Kirzner, T.W. Schultz, H. Leibenstein) define entrepreneurship as a human activity which aim is to reach equilibrium in the economy, meaning that production resources are spent in an optimal way, taking into account the characteristics of the economic environment. Authors presume, where the economic balance is, there is no other space for business and therefore we are doing businesses where is a mismatch between the demand and the supply. A profit is regarded as a fundamental motivating factor for business, which encourages and stimulates the entrepreneur and business results. (KNAZE, 2007) *Nowadays modern definitions of „entrepreneurship" are* as follow:

• as an interdisciplinary and rapidly growing area both in research and in education; (KATZ, 2005)
• as a set of business activities, which is the practical use of business opportunities that arise as a result of imbalances in the market (KUPKOVIČ, 1994)
• as a human activity, focusing on the achievement of equilibrium in the economy;
• as an economic activity that causes economic incentives;
• as a creative activity which businesses evolve.

Essential part of business assumptions are also legal presumptions. Business concept defines the following laws:

1. Licensing Act (Chamber of Trade, 2009)
   • has a public character (represented by public law)
   • governs the vertical relations (state - citizen)
   • requires the competence of operators for each trade
2. Commercial Code
   • has a private law nature (represented by private law)
   • adjusts the horizontal relations (relations between market players)

Under the Commercial Code, entrepreneurship is "sustained activity carried out independently in their own names on their own responsibility for profit." (Commercial Code, 2001)

3. Other legal standards
   • entrepreneurs have to comply with all applicable regulations and laws concerning the economy.

Characteristics of entrepreneurship are: independence of economic subjects, boldness, ingenuity, initiative and novelty-hunting in solving non-standard tasks and performance targets, the ability to resolve the conditions of uncertainty, the willingness to assume and bear the economic risks. Business according to Strážovská is "a positive force in economic growth that serves as a bridge between innovation and applications." (STRAŽOVSKÁ, 2009) The primary motive of business is a profit, which is the surplus between revenues and costs of business. Currently, there is a number of economists with similar opinion on the role of corporate profits in the economy abroad (Samuelson, Nordhaus and others) as well as in Slovakia (BIELIK, 2006).

2. Social Entrepreneurship in the Social Economy

Social entrepreneurship is based on linking economic principles and social objectives. It is a term that in recent years is developing not only in Slovakia; but its importance is growing along with the gradual appreciation of the importance and significance of integration of disadvantaged groups of

society. To these groups belong also persons with disabilities. Social entrepreneurship is trying to exploit and adapt to the social sphere, entrepreneurial spirit, principles and rules of competitiveness. It can therefore be considered as a strategy for sustainability of social programs in the future. The advantages of social entrepreneurship are: innovative search for new employment opportunities and business activities according to local conditions, also cross-sector and multi-level switching and multi-agency approach.

For the most recognized expert in the field of social economy is considered to be *Jacques Defourny*, a professor at the University of Liege and director of the Centre of social economy. The following definition of social entrepreneurship and social enterprise is coming from his materials: "Social entrepreneurship is a business with primarily social objectives, where the economic surplus are reinvested in the business for the same purpose or for the development of local communities, unlike the need to maximize profit for interested groups or owners." (CENTER FOR DEVELOPMENT, 2010)

Thus, social enterprise is characterized as a socially responsible company with significant economic social goals and objectives. Its activity is economic (with the business plan), a specific feature is reinvesting the profit (income) in its social objectives and for the benefit of local communities in which it operates. (DOHNALOVÁ, 2003) Basic principles of social enterprise are: focus on an entrepreneurship, social objectives (intentions) and social adequacy of monitoring activities. In the Slovak Republic (also based on international experience) should be an area of social economy in linking policy, employment policy, social assistance and social inclusion and community (local and regional) development.

Under the project funded by the European Union, and the project EQUAL were defined four basic subjects of social economy:

1. s*ocial enterprises* - businesses that operate in the area of social entrepreneurship, which include social and production cooperatives, sheltered workshops, public facilities, particularly social services, non-profit organization providing activities of public interest companies and charitable organizations;
2. *other legal and physical persons* - when they respect the principles of social economy, operating in the area of social entrepreneurship; and their objectives are a focus on creating social added value and not for making profit;
3. *municipal authority* - as a supervisor, coordinator, in order to increase employment, quality of life, reducing poverty and social exclusion in its territory;
4. *government* - as a controller, coordinator and participant in financial solutions to social justice, equality, social exclusion and employability of disadvantaged groups, supports the development of alternative models of

social economy, social entrepreneurship and new social enterprises. (Agency for Regional Development BBSK: EQAL, 2006)

The social economy is emerging as a response to certain needs. (SPEAR, 2001) It touches a particular area of social services; although it is not limited to them (examples are sheltered workshops, which produce goods). Other possible use of social enterprises is to provide services which have not been provided by the state. The range of services is very wide. Social enterprises are active especially in promoting socially responsible business and employment in business.

Social economics is conducted in Slovakia in the area of the third sector. Social enterprises differ themselves from traditional businesses in profitable private sector. Their primary objective is to assemble the needs of members of a particular group of people, communities or the wider public. On the other hand, the primary objective of private sector enterprises is to maximize their profits. Social economy, according to Laville, is the formation of entrepreneurial activities and businesses that are active in the market space and whose legal and organizational form (co-operatives, mutual and public benefit associations) is the guarantee of solidarity by reducing profits, or its redistribution to achieve social objectives of these enterprises. (LAVILLE, 2006) Basic theoretical background of social entrepreneurship in a market economy is the existence of three sectors, namely: private, public and third sectors. Subjects of the social economy can benefit from public resources, to take tax credits, public benefits, and so on. Condition of their operation is also suitable legal environment. Despite a commitment to the public sector, social enterprises are self-functioning, independent entities. Social enterprises are created to fulfil a purpose. They accomplish the social goals, although their activity is basically economic. They not prohibit the creation of profit, which should be reinvested (e.g. in the local community or a group of interested people). Many entities in the social economy are financed by funds raised from market activities, and also from a funding from the local (regional) authorities, or government. Other sources of income have non-monetary form, volunteering or donations.

3. Aim and methods

The main aim of the article is to identify active social enterprises in Slovakia and then propose a typology suitable for social enterprises operating in the Slovak market within social policy.

To meet the target, there were selected theoretical methods, which made it possible to identify the active social enterprises registered in the Registry of social enterprises. After verifying the actual state of chosen social enterprises,

authors used analysis and statistical methods for selecting the criteria of inclusion enterprises in the proposed typology. The basic selected features of social enterprises are: the legal framework within which the undertakings operate; the way of founding; the focus of economic activity (according to SK NACE); the allocation in the regions and districts (according to NUTS II and NUTS III); general conditions of formation of social enterprise, as well as other available information.

The following figure presents the distribution of social enterprises in Slovakia to 2010 within NUTS III (Higher Territorial Units), including the status of their registration in the Registry of social enterprises (A - active registration, P - registration suspended, cancelled registration-Z).

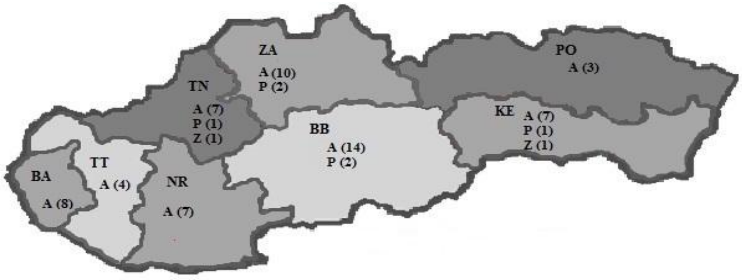

Figure 1 Allocation of social enterprises in Slovakia to November 2010 according to the Registry of social enterprises (NUTS III)
Source: authors, 2010.

Figure 1 shows that most social enterprises have been created or approved in the region of Banska Bystrica. The counterpart is presented by the regions of Presov and Trnava, where least approved enterprises are allocated. For the analysis of social enterprises in Slovakia and to propose a new typology of social enterprises were 13 social undertakings selected established by municipalities, and 42 social enterprises registered in the Registry of social enterprises, which were simultaneously recorded in the Commercial Register, Professional register, the Register of NGOs, Civil associations and the like. Of those 55 social enterprises established, there were 8 physical persons and 47 legal persons.

In terms of legal framework, social enterprises can be classified also according to legal and organizational forms of their founders (Figure 2).

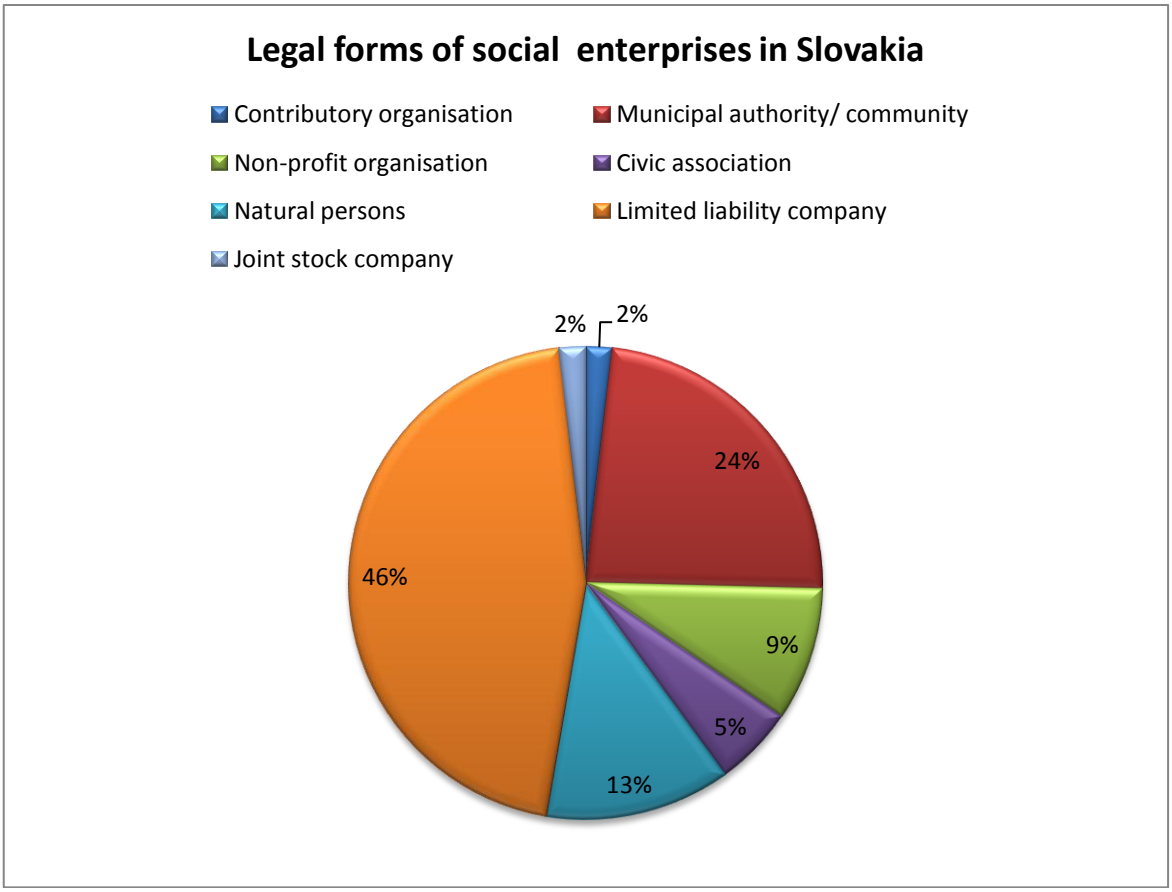

Figure 2 Legal forms of social enterprises in Slovakia
Source: authors, 2010.

According to the classification of economic activities by SK NACE (Chart 3), Slovak social enterprises are engaged mainly in the category N-Administration and supporting services (29 companies), especially in N/81 (activities related to buildings and landscape adaptation), and N/82 (administration, office support and other business support activities). Other economic activities in the focus of Slovak social enterprises are: category C – Manufacturing industries (21 companies), E - Water supply, purification and waste-water drainage, waste management and remediation activities (16 companies), Q - Health and social assistance (15 companies), F – Construction and building (14 companies), H - Transportation and storage (10 companies), R-Culture, entertainment and recreation (10 companies), I - Accommodation and food services (7 companies), G - Wholesale and retail trade, repair of motor vehicles and motorcycles (5 companies), J - Information and communication (3 companies), P - Education (3 companies), A - Agriculture, forestry and fishing (2 companies), M - Professional, scientific and technical services (2 companies), L - Real estate activities (1 company), S - Other service activities (1 company), U - Activities of extraterritorial organizations and associations (1 company).

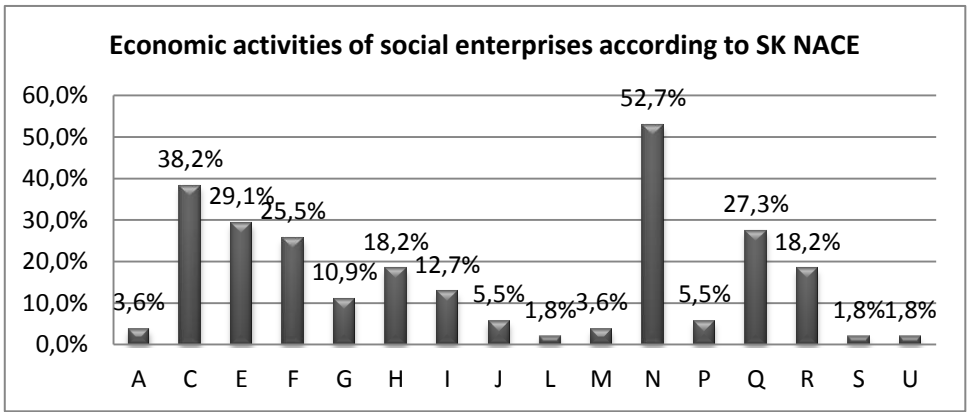

Figure 3 Distribution of social enterprises by their economic activity according to SK NACE rev.2
Source: authors 2010.

4. Social Entrepreneurship Approaches and Typology of Social Enterprises

Social enterprises are divided in terms of certain basic forms. J. Defourny says that an approach of social economics is built on identifying legal and institutional forms through which the social economy is seen. This approach is called *legal-institutional*. Another possible approach to the identification of social enterprises is its definition in terms of fundamental principles and the principles on which these businesses operate. This approach is called (by J. Defourny) *normative*, as it typically focus on finding common features of different businesses.

When we comparing the definition of non-profit sector with the definition of social economy, we find many similar features; for example: formal framework, the private nature of the organization, independence, autonomy, or voluntariness. However, we can also find two main differences: "one is the democratic management of organizations, which is a condition of the social economy and is not commonplace in the nonprofits sector. Another, perhaps more serious distinction, is the distribution of organizations´ profits. Nonprofits organizations don't distribute profits, while the social economy, which is based on cooperative principles, is based mainly on economic democracy."(DEFOURNY, 1999)

On the territory of Slovak Republic, social enterprises began to form themselves within the initiative of the Slovak Government in 2007 that endeavoured to establish social entrepreneurship as a medium of solving the issue of disadvantaged and long unemployed persons. Currently, 60 social enterprises operate in Slovakia according to the Registry of social enterprises of the Ministry of Labour, Social Affairs and Family. The Registry also identifies

two cancelled social enterprises and six with suspension. After further analysis, it was found that of 60 registered social enterprises with active status are two companies in liquidation, and three have cancelled registration, which is not yet recorded in the Registry of social enterprises.

Along with the examination of the nature of social enterprises, a Slovak legal framework of social entrepreneurship should be taken into account as it differs from those in other European countries. According to MLSAaF, social enterprise is a trade or a company that:

a) *employs employees*, who were before taking up employment disadvantaged job seekers (under the Employment Services Act) in the number representing at least 30% of the total number of employees;

b) *provides support and assistance to employees*, who prior to employment were disadvantaged job seekers, to find employment in the open labour market;

c) *uses every year at least 30% of received income from business activities*, which remain after payment of any expenditure on objects of business in the taxable period, to create new jobs or to improve working conditions;

d) *is registered* in the Registry of social enterprises.

According to MLSAaF for a registration of a social enterprise can apply physical or legal person, municipality, autonomous region, an association of municipalities, an association of autonomous regions under a special regulation, the budget authority or subsidized organization, whose founder or founders is a municipality or an autonomous region. Legal persons in these terms shall, upon the recognition of social enterprise, demonstrate the employment of at least 30% of employees of total employees who prior to employment were disadvantaged job seekers. After 12 months within those 30% shall be counted all employees who were applicants for employment, while it doesn't require being all disadvantaged job seekers. For physical persons, legislation does not regulate further conditions of social entrepreneurship. This vague legal regulation enables businesses to qualify for social enterprise and to receive support from the state and the European Social Fund. Not excluding, that there are no legal means of punishment for misusing of the status of social enterprise. Those specific conditions of Slovak social entrepreneurship are not enabling to include Slovak social enterprises in the existing typologies of social enterprises.

Over the past one hundred years, mainly three basic types of businesses appear. While they are variously interpreted in different cultures, in most EU countries they are modelled on three legal and institutional components of the social economy:

1. *cooperatives* (meet the economic, cultural or social needs and goals through a jointly owned and democratically controlled enterprise);

2. *mutual enterprises* (there existing to gather funds from members, through which subsequently are providing common services for members of society); and
3. *associations* (or non-profit organizations and associations, voluntary organizations, NGOs, charities and foundations) produce goods and services and their primary goal is not a profit. (ALEXY, 2007)

Within this basic typology, only 27 of 55 Slovak social enterprises can be included into different categories (Figure 1), 28 social enterprises cannot be classified under these categories.

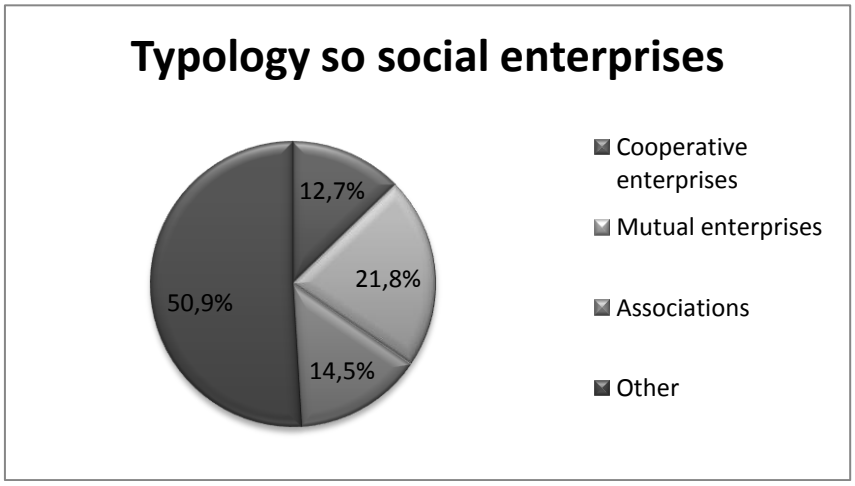

Figure 4 Types of social enterprises in Slovakia (according to Alexy, 2007)
Source: authors, 2010.

The most frequent form of social enterprises are social enterprises of labour inclusion WISE (Work Integration Social Enterprises). According to the typology of enterprises by WISE and the EMES network analysis we can talk about three basic types:

1. *social enterprises with a specific legal framework*, focusing only on labour market integration (e.g. type of social cooperatives in Italy);
2. *social enterprises focus only on labour market integration*, but without a specific legal status, including various legal and organizational forms (e.g. WISE in Belgium and France);
3. *other types of social enterprises that meet various social objectives*, including integration work (e.g. occupational cooperatives in Britain). (LUBELCOVÁ, 2006)

Nor the above typology is appropriate for a classification of the Slovak social enterprises, whereas in social entrepreneurship in Slovakia were developed only those social enterprises that are not explicitly dealing with social

and labour integration. Labour market integration should be an inevitable part of the nature of social enterprises, but in Slovak social enterprises it is rather a mean than an aim. Labour integration (and social integration in the wider sense) means integration of disadvantaged job seekers in the labour market (those with disabilities, marginalized, long unemployed). (LUBELCOVÁ, 2006)

Since there is no alternative interpretation of social enterprises suitable for the conditions of social entrepreneurship in Slovakia, it is necessary to create a *new typology* based on real market conditions and behaviour of social enterprises. In the Slovak labour market, there were 68 requests for a registration as social enterprises recorded; while at present (November 2010) only 55 social enterprises operates at Slovak territory. These selected social enterprises were divided according to several basic criteria:

- the founder,
- the economic activity, which is the enterprise primarily devoted to,
- the organization of the business unit and
- financial support from out-plant sources.

Type 1 ***Municipal public-benefit enterprises*** - social enterprises, founded by the municipalities, county authorities, associations of municipalities or autonomous regions, and budgetary or contributory organizations established by municipalities or regional governments. These social enterprises exist for the purpose of collecting funds from members of a specific segment of the society through which they provide common services for this segment. This type of social enterprises possesses characteristic economic activities in the social and public utility areas (street cleaning, waste management, landscaping, welfare, education, tourism and related services). In Slovakia, currently there are 13 social enterprises of the first type: City of Malacky, City of Senec, City of Sv. Jur, City of Sliač, City of Nitra, Municipality of Hrušov, Community services – contributory organization of Municipality Očová, Municipality of Kaluža, Municipality of Spišský Hrhov, Municipality of Štrba, Municipality of Nesluša, Municipality of Dubník, Municipality of Komjatice. The following figure (Figure 5) allocates the first type of social enterprises in Slovakia in particular regions (NUTS III).

Figure 5 Allocation and number of social enterprises of Type 1 (NUTS III)
Source: authors, 2010

Type 2 ***Public-benefit enterprises established by a physical person*** - social enterprises, whose founders are individuals under specific conditions that are engaged in social and public utility field. The primary goal of this type of social enterprise is not to profit but to satisfy the social or cultural needs of the society or its segment. At the present, there are no companies of this type in Slovakia, since all social enterprises set up by individuals seek to make a profit (Type 3).

Type 3 ***Business units established by a physical person*** - social enterprises, whose founders are individuals under specific conditions, dealing with activities in other areas such as social and public benefit. This type of social enterprises seek to make profit by producing goods and services, while social and labour inclusion of disadvantaged people is a secondary filling of these activities. In Slovakia there are currently seven social enterprises of this type: Ing. Vladimír Sirotka, Mary Lelovicsová - CLASSIC LADY M, Peter Kubička, Miroslav Šumský, PhDr. Jana Magurová, Jaroslav Košík, Ján Melichárek. Figure 6 shows the allocation of the third type of social enterprises in Slovakia in particular regions (NUTS III).

Figure 6 Allocation and number of social enterprises of Type 3 (NUTS III)
Source: authors, 2010

Type 4 ***Public-benefit enterprises established by a legal person*** - social enterprises, whose founders are legal persons under specific conditions dealing with activities in the field of social and public benefits. This category includes all organizations whose founders are mainly municipal undertakings, non-profit organizations, civic associations, non-investment funds and foundations, as well as limited liability companies, joint-stock companies, cooperatives and other forms of legal persons. The objective of their activity is not to profit, but to product public services and meet the economic, social and cultural needs of a particular segment of society. On the Slovak market operates 14 social enterprises of the fourth type, which are also shown in Figure 7: Pontis, Ngo., Nezábudka, Ngo., Mestské lesy Banská Štiavnica, Ltd., Civic association "VICTUS", Mestský podnik služieb Žarnovica, Ltd., RELIEF - POMOC V NÚDZI, Ngo., OBECNÝ PODNIK stavebno-poľnohospodárskej a lesnej

výroby Ltd., Ľudia a perspektíva – civic association, DOSOS, Ngo., Agentúra podporovaného zamestnávania Somotor, Ngo., EFKO – civic association, Obecný podnik Kostolné Kračany, Ltd., Obecný podnik Kráľovičove Kračany, Ltd., Obecný podnik Zlaté Klasy.

Figure 7 Allocation and number of social enterprises of Type 4 (NUTS III)
Source: authors, 2010

Type 5 ***Business units established by a legal person*** - social enterprises, whose founders are legal persons under specific conditions, dealing with activities in other areas such as social and public benefit. This category includes enterprises recorded in the Registry of social enterprises, while the core of their activity may not be public-benefit or labour inclusion. Enterprises of this kind produce goods and services for profit; however they are able to fulfil the required conditions of social entrepreneurship. Most of the Slovak social enterprises are classified into the fifth category - 21 enterprises. In terms of legal status, this category is dominated by a limited liaison company, and there figures also one joint stock company: AGROJAS Fabrics Ltd. EUROLIGHT Ltd., Profit, Ltd., LAMAX Plus Ltd., Oxygen Cafe Ltd., WOOD-PACK manufacture, Ltd. PAJMI Ltd., FRACHO SP, Ltd., SBO Ltd., Express Truck Slovakia, as, TREVA Ltd. AMH METAL Ltd., DELIKA Ltd., SETAMA Ltd., INTERES Ltd., HEFRA SK, sro, Holotéch víška Ltd., STOND Ltd., AM-REAL Ltd., LUREBOX Ltd. BENEFIT INTERNACIONAL Ltd. Their allocation for Slovakia is shown on the Figure 7.

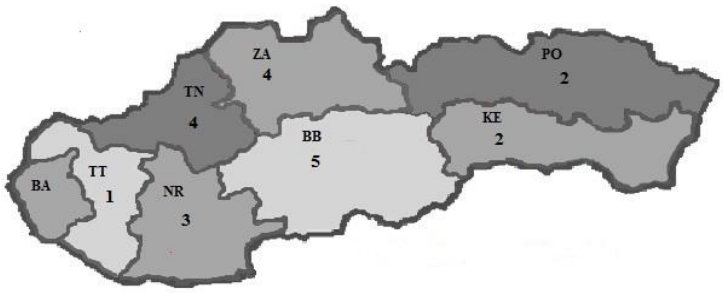

Figure 8 Allocation and number of social enterprises of Type 5 (NUTS III)
Source: authors, 2010.

Discussion

The issue of social entrepreneurship and social enterprises in Slovakia deals with various repercussions on its effectiveness, resp. inefficiency. In many European countries (UK, Italy, Germany, etc.) were social enterprises supported already in the previous century. Furthermore, legislation of the European Union regulating social entrepreneurship has been, despite national differences, gradually harmonized. Three years of functioning of social enterprises in Slovakia still does not assess the real state of social entrepreneurship. Slovak social enterprises are subjects of legislative modifications and development of social policy, which has not yet been able to absorb the specific conditions of social entrepreneurship in the Slovak market. The aim of the government in addressing the employment of disadvantaged job seekers is ambitious. However, it is very unlikely that Slovak social enterprises themselves would be able to solve this problem**.**

By means of analysis in this article, it is evident that the Slovak social enterprises vary considerably from the concept of social entrepreneurship generally accepted by foreign authors and governments. Many Slovak social enterprises differ themselves from traditional enterprises only by minor nuances adapted by social legislation. The obligation to employ at least 30% of disadvantaged job seekers of the total number of employees can be overcome after one year of their employment, when the 30% of may be formed by any job seekers. At the same time, enterprises may circumvent a second condition of the social enterprise - providing support and assistance to employees who prior to employment were disadvantaged jobseekers to find employment in the open labour market. It is almost impossible to check compliance of this condition, as it is not quantifiable. Within the third condition - reinvesting 30% of profits into creating new jobs or improving working conditions - it is possible for the firm to include a wide range of everyday running costs as a part of working conditions improvement. Similarly, we have disproved the fourth condition. Although some businesses were still recorded in the Registry of social enterprises, in fact they were already in liquidation, or otherwise been cancelled. These vague conditions allow many businesses to apply for the status of social enterprise, and then abuse the support from the European Social Fund, which covers the support of social entrepreneurship, as well as support from national resources.

To assure that social enterprises will fulfil the primary function for which they were established – social and labour inclusion - is necessary to shift to other types of social enterprises. According to the proposed typology, most enterprises are of Type 5 (21 firms) and Type 3 (7 companies) that represent social enterprises operating on the principle of making a profit from production of goods and services. However, enterprises of the Type 1, Type 2 and Type 4 are social enterprises whose aim are to meet certain social and cultural needs of

society and not needs of the company itself and this even in such circumstances, that the labour inclusion forms only a partial job description.

Conclusion

The issue of long-term unemployed and disadvantaged people presents an increasing trend, not only the phenomenon of Slovakia but generally. This problem has been the Slovak government trying to solve by establishing of social entrepreneurship since 2007, according to the model of foreign social enterprises. Because of the short existence of social enterprises in Slovakia, it is yet not possible to verify the overall efficiency of social entrepreneurship. In the article, the authors try to analyze social entrepreneurship and social enterprises in Slovakia, which was found inconsistent with the general concept of social entrepreneurship abroad. Due to specifics of Slovak social enterprises, authors had proposed a typology suitable for Slovak social enterprises, in which five basic types of social enterprises are identified: municipal public-benefit enterprises, public-benefit enterprises established by a physical person, business units established by a physical person, public-benefit enterprises established by a legal person and business units established by a legal person. Within this typology, 21 enterprises are classified of the Type 5 - business units established by a legal person, which represents traditional businesses aiming to profit. Similarly, there are 7 social enterprises of the Type 3 - business unit established by a physical person. Social enterprises aimed at public benefit activity, social inclusion and employment are classified into Type 1 (13 enterprises), Type 2 (no enterprises) and Type 4 (14 enterprises). Within the proposed typology, the Slovak government should focus on increasing the number of public-benefit enterprises, which are pursuing the need of a wider segment of society. Simultaneously, the government should put more emphasis on the core of the business activity of social enterprises ensuring the social and labour inclusion will be primary goals of social entrepreneurship. Currently, the labour inclusion of disadvantaged job seekers is not the main objective of any of the surveyed companies.

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FORECASTING AND ITS PRESENT TRENDS IN BUSINESS ENVIRONMENT

PROGNÓZOVANIE A JEHO SÚČASNÉ TRENDY V PODNIKATEĽSKOM PROSTREDÍ

Mária GIRGOŠKOVÁ – Daniela ROMANOVÁ

Abstract
The aim of this article is to bring the theoretical approaches to forecasts, forecasting. On the base of main approaches the authors attempt to highlight the current, modern problems at home and abroad, including several realized researches.

Keywords: forecast, forecasting, performance, competitive advantage

Abstrakt
Zámerom príspevku je priblíženie teoretických prístupov k problematike prognostiky, prognózovania. Vychádzajúc zo základných prístupov je v snahe autorov poukázať na súčasnú, novodobú problematiku doma aj v zahraničí, a to aj pomocou viacerých vykonaných výskumov.

Kľúčové slová: prognóza, prognózovanie, výkonnosť, konkurenčná výhoda

Introduction

Forecasting of the future development is one of the important business activities operating whether at international, national or regional level. The success of many decisions depends on the quality of forecasts of future development and is accompanied by some degree of uncertainty. In many enterprises is prevailing a low proportion of foresight in the management process. Executives do not realize a vital role in forecasting and strategic management of the company and are too oriented to the operational management and orientation in the short term.

In a global economy have the ability to survive the most performing businesses. Performance is not just a reflection of the value of selected financial business indicators, but increasingly implies the creation of enterprise value and its level of competitiveness. Companies which wish to achieve a top position and sustain a competitive advantage need prognostic system that would ensure the stabilization and purposefully increase of their performance, so as achieve a significant competitive advantage, which would be by competitive unshakable.

1 Forecasting

In the economic practice the issue of forecasting is becoming an integral part of the strategic management process. Forecasting is linked with planning and also with the decision making, because the conclusions of forecasts bound the framework for decision making. The basic steps in the process of forecasting according to Hanke (2001) are data collection, data reduction or condensation, model creation and evaluation, forecast generation and the forecast evaluation.

The question of forecasting is justified. It is not just the theoretical aspect of the problem, but also a very pragmatic perspective, taking into account the activities of planning at the enterprise level. Some generalization of the answering the question of the relation between forecast and plan may be the following argument: The forecast says about what will be, the plan talks about what it should be. In terms of process we see the forecast as a starting assumption for the plan creation. Forecast conclusions determine for the planner the scope of the future and therefore he accepts it in the plan. The forecast precedes the plan creation and the plan incorporates the results, the forecast conclusions to its underlying assumptions, goals. Forecasting process is a complex process which linearity in the time is mentioned here because of methodological reasons. The most important is understanding the reality that even in the forecasting process we should look at the forecast as on the product which has its consumer (e.g. top management of the company). Presentation of forecast (as a scenario of possible development) must meet the requirements determined by a sponsor and limitations (financial, human, ...) of the solving team. (Malindžák, 1999) Besides the basic steps is given the forecasting function. It involves the basic functions, namely cognitive and information, heuristic, analytical synthesizing, evaluation, interpretation, prescriptive, exploratory, feasibility, regulatory and warning function. (Buřita, 2003)

2 The modern area of forecasting

In the last third of twentieth century was increasing the significance of the prognostic works in the world but recently also in the countries in transition that led to the development of procedures to achieve the most trustworthy visions about desired development of all innovation systems, but mainly about the substantive direction of research, development and innovative activities.

2.1 Research in the area of forecasting

Based on various research activities was gradually formed the Technology Foresight methodology, which proven successful results in the field of concentrating of research effort and the creation of system linkages between

social agents in the management of socio-economic activities and rationalization of research and development works and increasing of the overall competitiveness of national productions led the European Union authorities to support and development of the work of this character within the member countries in recent years, even in the candidate, and other European countries. (Lisbon strategy)

In Slovakia, the Government approved by its own resolution no. 1007 from 04/09/2002 draft of state programs of research and development for the period 2003 to 2015. In a review of 10 selected state programs also figures the Forecast of development and usage of science and technology by 2015, with specifying the procedure of its processing by Technology Foresight method. This study was prepared by the Institute for Forecasting SAV within I. phase of state program solution.

In the Czech Republic, Czech National Bank (CNB) approved for 2007-2012 Economic Research, whose mission is to provide relevant outputs for the central bank, and which have a high standard internationally. Relevant outputs should help the CNB to extend knowledge background necessary for its main activity: monetary policy, financial sector supervision and maintenance of financial stability. Among the five priority research topics is included the area of Macroeconomic modeling and forecasting. These include:

- improving current forecasting models,
- development of alternative forecasting more empirical models,
- control of robustness,
- contributions to model-forecasting activity of the ESCB.

Research should be also focused on the conceptual framework, by which will be possible to solve issues relevant to monetary policy in terms of euro area member states, which must be able to work with forecasts created parallel by the individual states and with the forecasts for the euro area, and which therefore must be dealt with the issue of forecast sharing by individual states or with the forecasting of aggregate values for the euro area. Forecasting the economic development of euro area member states will be an important part of the forecasting exercise of the ESCB, and therefore research should help to update forecasting models and to take into account the adoption of the euro.

PricewaterhouseCoopers company in 2007 realized a research. The research should find out in what way a financial institutions approach to the preparation of budgets and forecasts of future developments. The aim was to determine how financial managers respond to new opportunities and also reveal the connections between modern methods and overall satisfaction with the process of financial planning in large organizations. In the research were participated 75 financial institutions around the world. Observed results, which

was confirmed by interviews with several major financial managers, shows that most companies are not satisfied with their own financial planning process and recognizes the need for a change. Too much effort is devoted to activities with low added value (e.g. data collection and consolidation, control, approval and preparation of reports). These activities should be reduced in future and finance department should more devote to the support of strategic decision making. The research also showed:

- 55% of the total effort, spent on preparing budgets and forecasts, provides very little added value;
- 70% of respondents are significantly dependent on the table calculators, the number of companies are aware of high dissatisfaction among employees and management with the current planning process, the reason is mainly the excessive complexity and lack of consistency with corporate strategy;
- 72% of respondents believe that the strategic importance of budgeting and forecasting should continue grow, only 3% of respondents are convinced of the contrary;
- for 56% of respondents is developing a closer links between strategy and operational areas of the company a top priority.

Efforts to create budgets and forecasts must be transferred to the processes of strategic character, which help senior officials in formulating and monitoring strategy, revenue growth and cost control. It can be reached by combining the planning process with business performance management processes (including financial consolidation, analytical reporting and the process of compensation and rewards) with the aim to minimize the overall time spent on activities with low added value and maximum use knowledge and analytical skills of the workers of financial department.

2.2 Forecasting versus informatization

An important factor of present is the informatization of society. This trend gradually penetrates into the area of forecasting. The growing use of computers in forecasting is perspective because of the possibility to generate many scenarios and creation of complex models. Computer use in the processing of the forecasts can be seen in Table 1, where the high use of the different programs enters into the highest percentages.

Sort of computer program	Exploitation of computer in processing of forecast (%)		
	Never	Medium	High
Tables	48	12	40
Internally developed programs	29	29	42
Commercially available programs	1	10	89
Programs developed by contractors	0	13	87

Table 1 Exploitation of computer in processing of forecast
Source: [online] [cited 23.7.2009] Available on: <www.forecastingprinciple.com>

The following graphs represent the percentage of computer use in the processing of the forecasts:

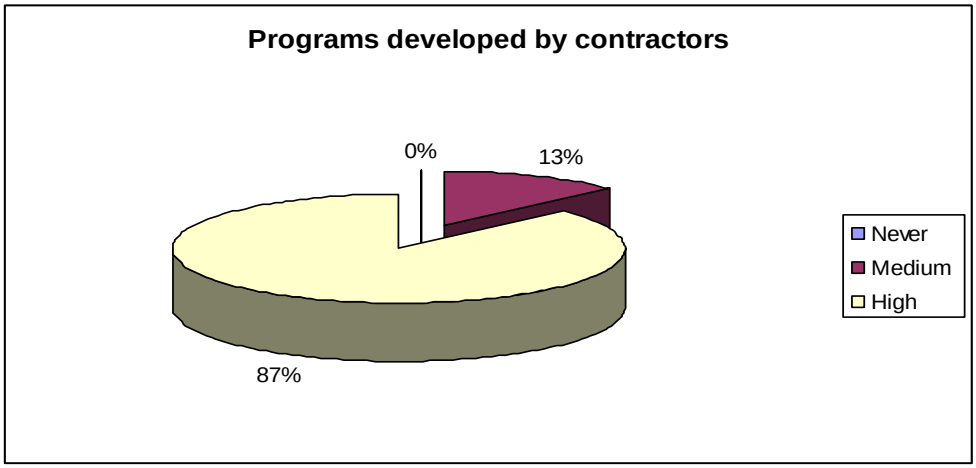

Figure 1 Usage of programs developed by contractors
Source: [online] [cited 23.7.2009] Available on: <www.forecastingprinciple.com>

In the figure above is showed the use of computer at the programs developed by contractors in processing the forecasts. We can see that the high use of computer at this programs is prevailing and makes up 87%. The none usage of computer received 0%.

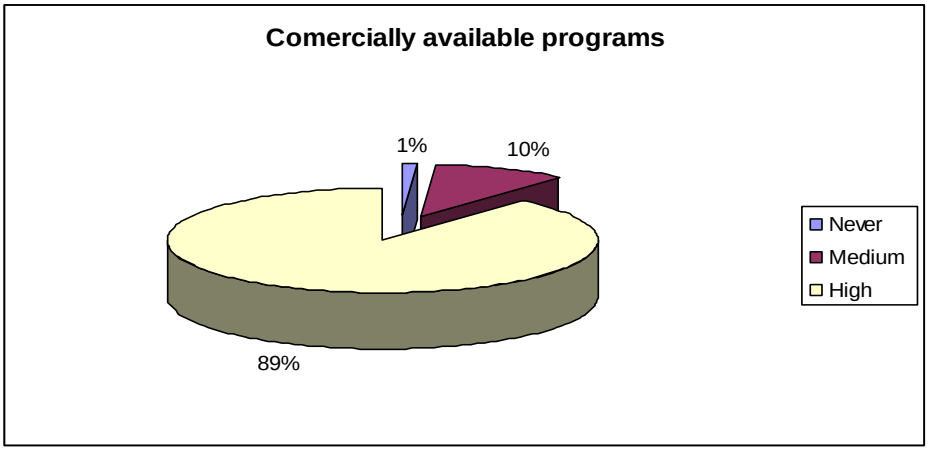

Figure 2 Usage of commercially available programs
Source: [online] [cited 23.7.2009] Available on: <www.forecastingprinciple.com>

Usage of computer at commercially available programs is similar to programs developed by contractors, and it is nearly similar in all possibilities - never, medium and high.

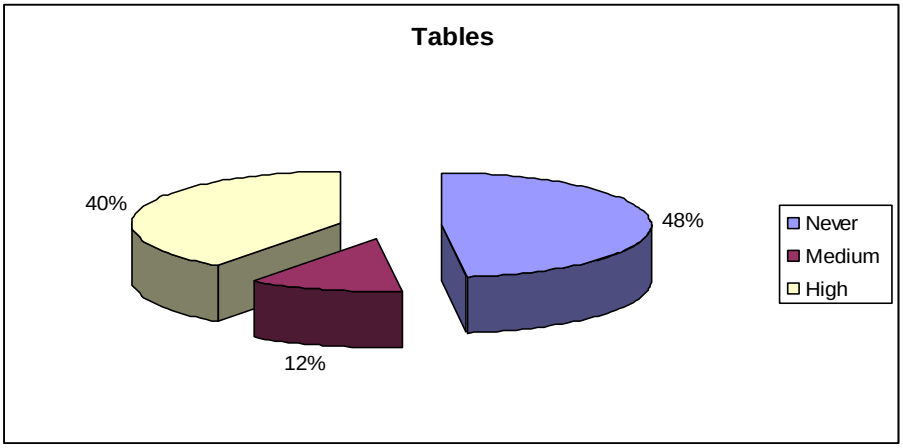

Figure 3 Usage of tables
Source: [online] [cited 23.7.2009] Available on: <www.forecastingprinciple.com>

On the basis of research results, taking into account the usage of tables, the forecasting is realized in the companies even without using a computer, it is nearly 49%, what is almost half of the total. Only medium usage of computers has 12%, and high usage has 40%.

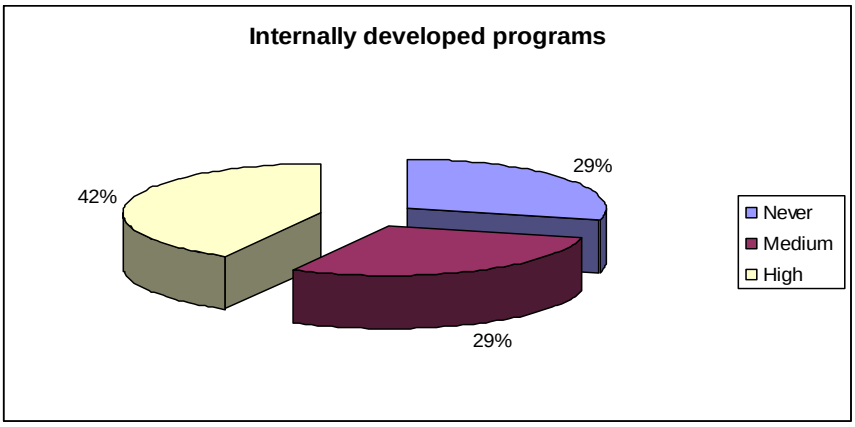

Figure 4 Usage of internally developed programs
Source: [online] [cited 23.7.2009] Available on: <www.forecastingprinciple.com>

In the last graph, which describes usage of computer at internally developed programs, is computer used medium in 29% of cases, and at the same percentage does not, high usage has only 40%.

Computer software market constantly brings a number of software solutions for the forecasting area. The SAP company provides software solution SAP Business Planning and Consolidation. This product is designed for businesses that operate in a dynamic market, where a comprehensive performance management has increasing importance. On the one side, strategic decisions should be based on solid facts, but on the other side, the development

of the market should be estimated directly, so that businesses could use developing business opportunities. It causes constant pressure on the work of financial managers (CFO), they must respond to the demands and challenges that come from outside the company, but also from company management. They are still more engaged in the tasks of managing the overall performance of the company, they are becoming the "Chief Performance Officers."

Software solution SAP Business Planning and Consolidation allows companies to gradually substitute manual processes by an efficient workflow that will improve and short the planning cycle. Similarly IBM company offers an extensive range of world-class software solutions Cognos for small and medium-sized enterprises. Through software for managing the financial performance and business intelligence world class Cognos helps companies to plan, understand and manage financial and operational performance. It enables company to understand and monitor current performance and also to plan future business strategies.

Conclusion

The economic crisis has negative affected business subjects and the overall economic environment. By jumps in the market needs, fluctuations of prices, growing unemployment and other factors it brought dynamic changes and increasing turbulence of business environment. Several forecasting methods used so far start to become ineffective and gradually increase the need for implementation of the forecasting methods with greater expressive ability. They are forecasting methods that are more suitable for application in a dynamic business environment full of unforeseen changes. With the gradual development of informatization, there is an increase in importance of software solutions for forecasting. They are designed primarily to companies operating in a dynamic market, where a comprehensive performance management is still more important.

Effort to predict the future is linked with effort to eliminate risk in the future. It represents a competitive advantage because it gives the company the opportunity to prepare for the future. Forecasting therefore represents a basis for strategic decisions of each company and its strategy.

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STRATEGY IMPLEMENTATION BY BALANCED SCORECARD SYSTEM – OPPORTUNITY FOR PUBLIC ADMINISTRATION

IMPLEMENTÁCIA STRATÉGIE SYSTÉMOM BALANCED SCORECARD – PRÍLEŽITOSŤ AJ PRE VEREJNÚ SPRÁVU

Beáta GAVUROVÁ – Patrycja PUDLO

Abstract
Prevalent majority of Slovak companies has been exclusively controlled on the basis of the financial indicators so far that depend on account data as well as describe and copy the past. Despite the incontestable significance of the financial indicators, there are no required effects in the future that will show an effort of their presenting in a very short period of time. This deficiency is primarily eliminated by Balanced Scorecard system that was created by American experts Kaplan and Norton (2005), and the successful implementation of this system enables its usage in private as well as public sphere abroad for twenty years. The conception of the BSC has been evolving since its creation, and even today there are many areas which ought to be improved. The contribution justifies, except the critical places of the BSC system, which are profiled from their own scientific and experimental studies, also the significance of the BSC application in the sphere of public administration, for which it is also inevitable to apply effective, active, and modern approaches in problem control and problem solving.

Keywords: strategic management, strategy implementation, Balanced Scorecard, the BSC, public sector, reporting in the BSC

Abstrakt
Prevažná väčšina slovenských podnikov bola doposiaľ riadená výlučne na základe finančných ukazovateľov, opierajúcich sa o účtovné dáta a popisujúce a kopírujúce minulosť. Aj keď je význam finančných ukazovateľov nepopierateľný, snaha o ich vykazovanie v čoraz kratších časových intervaloch neprináša žiadané efekty do budúcnosti. Tento nedostatok sa snaží eliminovať práve systém Balanced Scorecard (BSC), ktorý vyvinuli americkí odborníci Kaplan a Norton (2005) a benefity z jej úspešnej implementácie využívajú v zahraničí už dve desiatky rokov v súkromnom aj verejnom sektore. Koncepcia BSC sa od svojho vzniku neustále vyvíja a aj v súčasnosti sú známe oblasti, ktoré je potrebné zdokonaliť. Príspevok zdôvodňuje okrem kritických miest vyprofilovaných z vlastnej vedeckovýskumnej štúdie aj význam aplikácie BSC v oblasti verejnej správy, pre ktorú je taktiež nevyhnutné uplatňovať efektívne, účinné a moderné prístupy v riadení a riešení problémov.

Kľúčové slová: strategické riadenie, implementácia stratégie, Balanced Scorecard, BSC, verejný sektor, reporting v BSC

Introduction

Organization strategy cannot be an annual occasion; it has to be a dialogue, which is realized during the whole year. Inadequate company results may signalize not only a wrong strategy, but predominantly its bad implementation. Management Balanced Scorecard system provides continual and incessant strategic communication, regular quantification of integral efficiency, and it also monitors the level of implementation of the strategy setting. Similarly as a balance sheet or a statement of cash flow describe the financial health of a company, so the BSC and a strategic map discuss the strategic health of a company. The strategic focus of a company has a narrow connection to the specified vision of a company, and it is created on the basis of existing documents. The major problem for many companies is the question of a choice and determination of a process sequence as well as of methods in the process of strategy creation and implementation, subsequently the choice of particular functional areas, and their associated and accountable persons.

1. Strategy implementation in organization

In domestic as well as foreign sources, there is a proper attention given to the theme of strategy implementation. Birnbaum (2006) introduces six supporting factors of strategy implementation: operational planning, organizational structure, human resources, annual business plan, monitoring and control, cohesion and harmonization. Similarly Irwin (1995) himself perceives implementation as an internal activity, which includes organization, budgeting, motivation, building culture, control and management. Both authors Kaplan and Norton (2001) state that strategy implementation requires a constant emphasis on alternation and efficiency. If there are no natural leaders at the head of the processes, changes will not be realized, strategy will not be implemented, and an opportunity for an efficient advance will disappear. **Strategy implementation** is a complicated task that causes many obstacles and complications, which managers have to deal with. There are six specified approaches which identify and describe specific critical factors of strategy implementation (Tab. 1).

Table 1 Critical factors of strategy implementation

AUTHOR	CRITICAL FACTORS OF STRATEGY IMPLEMENTATION
Niven (2008)	• vision barrier (it is not sufficiently and comprehensibly conveyed to all employees), • people barrier (activities and aims are not interconnected with a strategic tendency), • management barrier (it analyzes financial results), • sources barrier (budgets are not connected to strategic aims).
Gurowitz (2007)	• formulation and effective communication of vision and values, • formulation and effective communication of mission, • enthusiasm generation, • loyalty to projects and activities that help to fulfill the mission, • creation of organizational architecture that enables to strengthen status and communication, • creation of short-time goals and strategies at local level, • effective action and responsibility context.
Kassay (2006)	• vaguely defined strategic aims and their inconsistence, • strategy set inappropriately, • strategic operations elaborated insufficiently, • professional inability of company employees to realize strategic operations, • insufficient flow of creation of sources and strategic operations, • insufficient control system, • low employee and team motivation.
Mallya (2005)	• company ability to create an environment that supports changes, • use of strategic leadership, • building ethical company climate, • building culture in accordance with strategy, • effective allocation of sources, • effective motivational system.
Slávik (2005)	• proposed strategy is not a strategy from official point of view, • strategy is not implementing from the content's point of view, • strategy is not conceived and accepted by its potential organizers.
Beer-Eisenstat (2000)	• vague strategy and conflicting priorities, • ineffective senior-management team, • insufficient vertical communication, • low coordination among company units or their individual functions, • top-down or laissez-faire form of management from senior-management side, inadequate leadership abilities and development.

Source: own elaboration

Principal factors that should be taken into consideration are certainly strategy understanding and its acceptance by potential organizers, effective communication in company, and coordination of projects and activities. The paper recommends, with regard to the previous factors of strategy implementation, to all companies to be concerned with all these spheres:

- *strategy communication in the whole company,*
- *involving people into the strategy implementation,*
- *responsibility assignment for strategic projects,*
- *adjustment of organizational structure,*
- *implementation of efficient control mechanisms.*

One of the efficient tools of strategy implementation is also the Balanced Scorecard system, which at present represents a "multidimensional" system that helps to define and realize organizational and management strategies on behalf of maximization of value formation.

1.1 Balanced Scorecard system

Balanced Scorecard system was created as a reaction to empirical findings that stated an impossibility to realize many of the planned strategic objectives. At present, there is a strong shortening of a validity period of strategy as well as an increase of requirements on quality and effectiveness of a strategic planning and management. The main aim to successful organization is an express and efficient strategy implementation. Why does every organization need the BSC? The BSC preserves a financial evaluation as a basis for business and management success, but it emphasizes an integral evaluation, predominantly from a long-term perspective. Integrated efficiency measurement by means of the Balanced Scorecard system connects customer's perspective, perspective of internal processes, and employee's and financial perspective as well. Long-term financial prosperity and continuity of company will be reached providing the correctly determined strategy. The BSC system represents a new model of company strategic management. According to Kaplan and Norton (2005), it has to contain the following processes to fulfill its function:

1. resolution and accomplishment of vision and strategy into concrete objectives,
2. communication and interconnection of strategic plans and standards,
3. planning, determination of objectives and harmonization of strategic initiatives,
4. improvement of the strategic feedback and the process of learning.

1.2 Criticism of Balanced Scorecard system

Nowadays the BSC has several interpretations. It is a tool of some strategic disciplines, and also of an integral part of an accounting and controlling, information systems and data processing as well as management of human resources (Braam – Heusinkveld – Benders – Aubel, 2002). Four critical areas of the BSC system, which have been profiled on the basis of the research results, are connected to a support of efficiency measurement as well as strategy implementation: metrics, system statistics, interest groups, and social aspects.

The most serious restrictions are directed to the metrics, and the reason is the interconnection of objective financial standards with subjective non-financial standards. The metrics problem has become very complex and it requires objective, professional, precise, and individualized approach. The sole standards are not the only aspect problems, but also their definition, characteristics, determination of content, structure, number, connections between them, and mutual equilibrium. Systematic problems are connected to the determination of their target and critical values. The most frequent reasons of malfunction of the BSC system are low, ambiguously, or very complex defined standards, subsequently an insufficient number that does not enable to cover all areas, or their excessive number by which there is a generation of high number of irrelevant data. The BSC system is static as in one strategic map there are conveyed standard values in specific period (Nørreklit, 2000). The strategic map displays a simplified model of a real system, in which there is an absence of making provision for problem of time delay and changes in external environment. These changes may lead to a formation of an emergent strategy, or to a revision of strategy implementation. The BSC system should be connected to a competition monitoring. Implementation of the BSC may completely isolate the phase of strategy implementation from the process of strategic analysis (external and internal), and the process of strategy formulation, while emerging from the phases of the strategic management process, which is divided into the process of formulation and strategy implementation. The only risk of the BSC role is an emphasis on efficiency measurement and management. The BSC strategic maps do not involve all relevant interest groups (suppliers or public authorities) (Nørreklit, 2000). The BSC system also does not select an importance of information resulting from the BSC standards for owners and stakeholders on the one hand, and managers on the other hand. Wrong setting may cause the BSC generation of much useless information, or even it may harm a company. Advisory and consultative companies, which represent the application of the BSC system in Slovakia, are predominantly oriented to technical questions of system implementation and in minor rate they are dealing with the critical social aspects, as for example, organizational culture, management form, communication, etc. (e.g. Roos, 1995).

2. The BSC research in Slovak companies

The research was realized in companies with a real implemented and used BSC system. The paper emerges from the knowledge obtained by author's own scientific and technical activity, participation at professional seminars, and from the results of foreign researches in finding of what companies implement the BSC system in Slovakia. On the basis of previous information, it was found that the BSC system is implemented by Slovak advisory and consultative companies

as well as companies dealing with informational systems and informational technologies (IS/IT). Information was obtained by means of companies' websites, which have been identified by web search, with regard to the character of companies. It has been identified about 40 companies implementing the BSC system, but only 20 of them have really implemented the system. These companies were subsequently addressed. Intrinsically, 80 % of all companies with an experience of the BSC system expressed an interest to participate in the research, which was realized in 2009. Companies were required to fill the semi-structured questionnaire to participate in the research. A combined method of contacting in the form of written, electronic, and personal questionnaire was used during the research (depending on the managers' preference). The second research sample, 16 companies with the BSC implementation that were personally visited, was obtained on the basis of the references in questionnaire.

2.1 Characteristics of companies using the BSC system in Slovakia

In the sample of 16 companies using the BSC system in Slovakia were companies at the age from 8 to 14 years since their foundation, while the highest rate is represented by the companies established in a certain branch for 10 years (37,5 %). The number of employees in a company describes a representation exclusively in medium and large companies. Three quarters of respondents were active as in Slovakia so abroad. It is also influenced by 38 % share of foreign major company owner. Five-year experience with the BSC system had 38 % of respondents, and the same portion had the companies with six – year usage of the BSC and 4 (25 %). 13 % of respondents had the BSC in a stage of implementation, or more precisely, in a test operation. The BSC system was frequently implemented in the area of trade and industry (71 %), and in minor rate, in the area of health care (29 %).
The next subchapter deals specifically with the companies in public administration.

2.2 The BSC in public administration

In Slovakia, there exists so called parallel model of public administration, in which the state administration is totally separated and independent part of public administration. Public administration is organized at three levels: state – county – municipality. There are specific and different aims for private and public sector: effectiveness and efficiency (private sector), and transparency and legitimacy of activities (public sector).

3. Particularities of the BSC system in public administration

Strategy in the public administration as opposed to the private sector represents a complex process. It is principally connected to a limitation given by a legislative scope as well as in orientation towards a citizen. It is inevitable to respect the following criteria while creating the BSC system in the public sector:

1. Distinction between the lawfully given and individual strategy. This is the reason of low number of chosen targets.
2. Targets of individual and given (by law) strategy have to correspond with each other.
3. Given targets do not have to be strategically significant.

Table 2 describes the basic differences between the BSC in a company sphere and a public administration.

Table 2 Main differences between the BSC model in company and in public sector

Aspect	Company BSC	BSC in public sector
Function of management	System of strategic measurement	Working of strategy and criteria for its fulfillment.
Starting point	Company vision, strategy	Formulation of vision, responsibility assignment at the strategic level.
The most important factors of success	Individualized according to the type of company	Matrix of employees' results, accomplishment of stated criteria.
Way of target determination	To each strategic target is assigned strategic initiative, standard, target value.	More levels of target achievement, minimal, the most probable, maximal.
The BSC implementation	• Business plan • Plan of personal development • Annual reports	• Budget • Annual operational plan • Annual reports

Source: own elaboration

Reasons for the BSC application in the public administration

Strategy practice

Even if the public administration can not realize some of the strategic targets, because they result from legislative action, the responsible employees take responsibility for the fact that these targets will be considered as strategic, and that their effort will lead to their achievement. Despite the fact that strategic targets are based on self-determination, or given by the law, the public administration has the same initial position as the private sector: "How can politician control the realization of his vision?" How can we join the question

"What" (targets) with the question "How" (strategic actions)? "How can we control and measure the accomplished targets?" (Horváth & Partners, 2004).

Criticism of standard indicator system

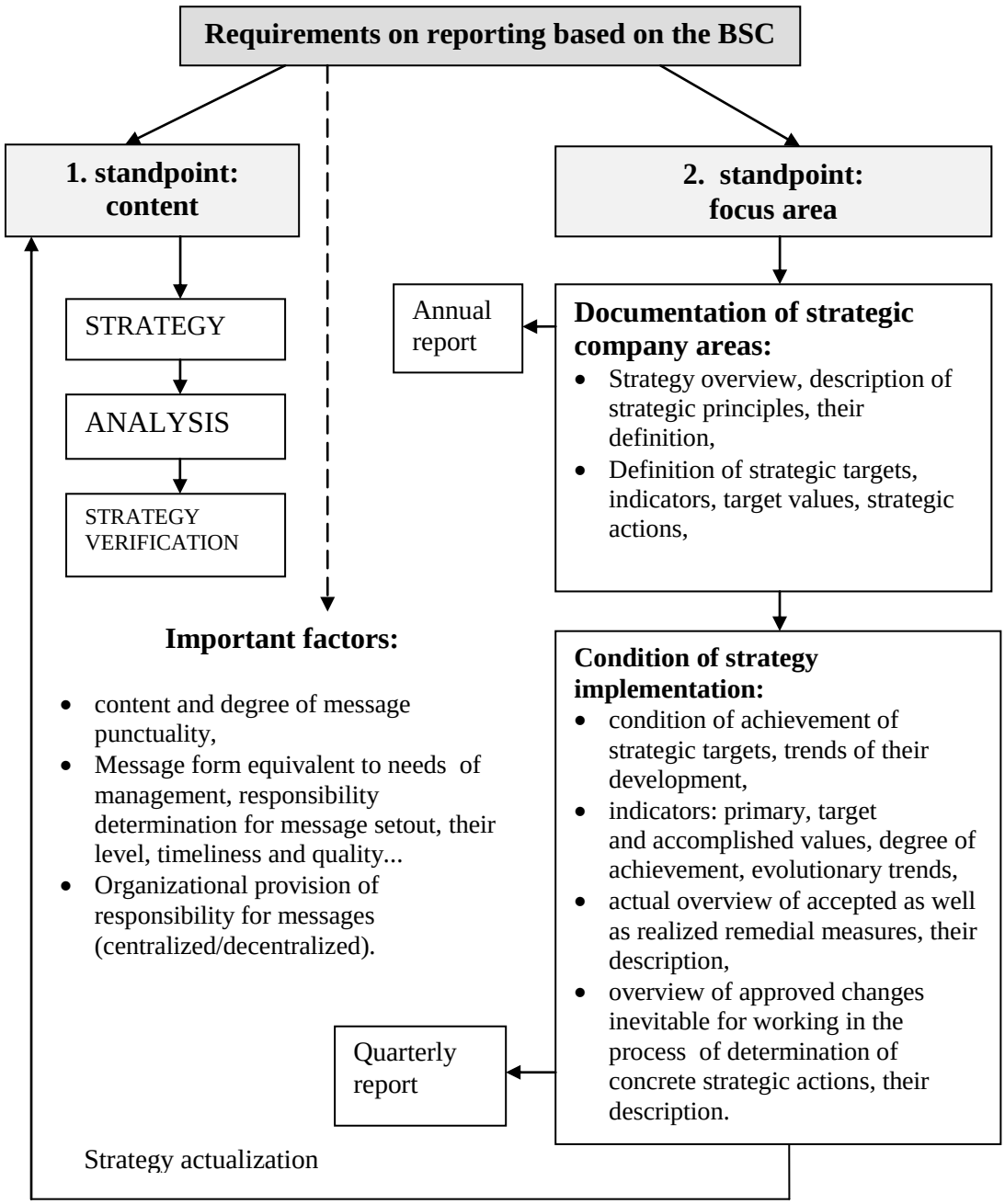
In using the indicator system, public administration has not as rich tradition as private sector. Public administration obtains many possibilities of effective data using for its management by improvement of expense and profit calculation methodologies, and by proposal of optimal metrics. It is necessary to constantly improve the conceptions of measure to specify such indicators that enable to monitor and consequently to evaluate success and efficiency of own activity from several organization perspectives as well as to provide benchmarking.

Systematization and reevaluation of reporting

The aim of reporting redefining based on the BSC is to provide important information to managers for their management. Public administration problem from the perspective of strategic target determination is more difficult than in private companies. This is the reason of a clear difference between the reporting of private and public sector. Reporting of each company area should provide a consistent overview about the condition of strategy implementation. It should also contain the proposals related to new units of management. Generally, it has to provide an institutionalized, regular, and relevant system of messages. Picture 1 displays the basic requirements on reporting in the BSC context.

Planning process aimed at achieving the targets and results

Differences in the planning processes in public and private sector are predominantly in their complexity. Private companies shorten and simplify the process of planning, and public sector relates predominantly to targets and results and it orients to a source allocation. Planning process is also determined by various political negotiations, etc.



Picture 1 Requirements on reporting in the BSC context
Source: own elaboration

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Need to improve an external reporting system

The fact is that the financial targets of public sector represent the frame conditions and not the primary targets, the strategic targets and their indicators may be clearly defined by means of the BSC. Information security emerging from an external environment has bigger significance in political sphere than in private sector. While companies use these information to communicate with investors and owners, public administration has a duty to take responsibility for its activities and treatment with public sources (Horváth & Partners, 2004).

Conclusion

At present, public administration is also exposed to a large pressure of changing its system of management and measurement of quality and efficiency. One of many ways is precisely the implementation of modern, innovative managerial methods, and top managers are responsible for the right choice of management strategy as well as for showing their willingness to change an actual company management system in an effort to increase quality and efficiency. Many foreign countries use benefits, e.g. from using the Balanced Scorecard system for almost twenty years in the area of private and public sector.

The complex study, which would be devoted to the problem of implementation of the BSC system as a system for company strategy implementation, has not been realized in Slovak companies so far. There also exist only few empirical proofs of the number of companies, which ones and by what form they implement the BSC system in Slovakia. Similar situation is also in Czech Republic, although the use of the BSC had been already mapped (Remeš, 2008). In foreign practice, there exist many examples of the BSC use predominantly in the area of health care and social services. The BSC application, at the level of self-government, is declared on low number of examples in abroad. In Czech Republic, there have appeared the first outlets of the BSC application in Czech public administration. The realized research (Dvořáková, 2006) points to many barriers of the BSC implementation in the area of public administration, which consist in a large unfamiliarity with possibilities for public administration that are hidden in this system.

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SOME RESULTS ABOUT THE AFFINE HJELMSLEV PLANE

NIEKTORÉ VÝSLEDKY O AFINNEJ HJELMSLEVOVEJ ROVINE

Rastislav JURGA

Abstract
This paper is focused on the introduction of the coordinate system in the affine Hjelmslev plane over the special local ring. The model of the affine Hjelmslev plane was used at the project of the experiments.

Keywords: special local ring, affine Hjelmslev plane, coordinate system in the affine Hjelmslev plane

Abstrakt
Tento článok je zameraný na zavedenie súradnicového systému v afinnej Hjelmslevovej rovine nad špeciálnym lokálnym okruhom. Model afinnej Hjelmslevovej roviny bol použitý pri plánovaní experimentov.

Kľúčové slová: špeciálny lokálny okruh, afinná Hjelmslevova rovina, súradnicový systém v afinnej Hjelmslevovej rovine

1. Preliminaries

Let $(\mathcal{B}, \mathcal{P}, \mathcal{I})$ be an incidence structure, we call the elements of the set $\mathcal{B}$ the points of the incidence structure, we call the elements of the set $\mathcal{P}$ the lines of the incidence structure and $\mathcal{I}$ is the relation of the incidence between points and lines. Define

Definition 1.1. The incidence structures $(\mathcal{B}, \mathcal{P}, \mathcal{I})$ and $(\mathcal{B}', \mathcal{P}', \mathcal{I}')$ are isomorphic if there is a bijective mapping $\varphi: \mathcal{B} \cup \mathcal{P} \to \mathcal{B}' \cup \mathcal{P}'$ such that it holds

1. $\varphi(\mathcal{B}) = \mathcal{B}'$, $\varphi(\mathcal{P}) = \mathcal{P}'$

1. A $\mathcal{I}$a if and only if $\varphi(A)\mathcal{I}'\varphi(a)$ for $A \in \mathcal{B}$ and $a \in \mathcal{P}$.

Define the relation of neighbouring between points and lines of the incidence structure $(\mathcal{B}, \mathcal{P}, \mathcal{I})$.

Definition 1.2. We will call two points A, B $\in \mathcal{B}$ neighbouring if there are the lines p, q $\in \mathcal{P}$, p $\neq$ q such that A, B $\mathcal{I}$p and A, B $\mathcal{I}$q too. Two lines p, q $\in \mathcal{P}$ are neighbouring if there are the points A, B $\in \mathcal{B}$ such that A$\mathcal{I}$p, q and B $\mathcal{I}$pq.

2. The affine Hjelmslev plane

We introduce a concept of an affine Hjelmslev plane.

Definition 2.1. The affine Hjelmslev plane is the incidence structure $\mathcal{A}$ ($\mathcal{B}$, $\mathcal{P}$, $\mathcal{I}$) which satisfies the following axioms

A1.: Two points A, B $\in \mathcal{B}$ are incident to at least one line p $\in \mathcal{P}$.

A2.: There is a binar relation of a parallelism such that for a given couple point, line
- A, p there is a unique line q $\in \mathcal{P}$ such that A $\in$ q and p is parallel to q.

A3.: If p $\neq$ q and p and q are neighbouring then the lines p, q have at least one common point.

A4.: There is a canonical homomorphism $\varphi_{\mathcal{A}}$ from the plane $\mathcal{A}$ into an affine plane $\overline{\mathcal{A}}$ such that $\varphi_{\mathcal{A}}$ (A) = $\varphi_{\mathcal{A}}$ (B) if the points A, B are neighbouring and $\varphi_{\mathcal{A}}$(p) = $\varphi_{\mathcal{A}}$ (q) if the lines p, q are neighbouring.

Let R be a finite commutative ring with the unit 1. Let a characteristic of the ring R be odd.

Definition 2.2. The ring R is called local if R has unique maximal ideal. Let us denote this maximal ideal by the symbol I.

Definition 2.3. A special local ring R is the finite commutative local ring R, the ideal I of which is principal.

We introduce a coordinate system in the affine Hjelmslev plane by the help a coordinate system in a projective Hjelmslev plane. Following considerations are directed on the introduction of the coordinate system in the projective Hjelmslev plane over the special
local ring R let us denote in next $\mathcal{H}$(R).

Let us denote a canonical homomorphism from the plane $\mathcal{H}(R)$ on to a projective plane $\Pi(\bar{R})$ by the symbol $\Psi : \mathcal{H}(R) \to \Pi(\bar{R})$.

Definition 2.4. A coordinate system in the projective Hjelmslev plane $\mathcal{H}(R)$ is the arranged quadruple of points E_1, E_2, E_3, E_4 such that points $\bar{E}_1, \bar{E}_2, \bar{E}_3, \bar{E}_4 \in \Pi(\bar{R})$ generate the coordinate system in the projective plane $\Pi(\bar{R})$, e.g. no tree from points $\bar{E}_1, \bar{E}_2, \bar{E}_3, \bar{E}_4$ are not colinear.

If the point X is given by the vector $x = (x_1, x_2, x_3)$, we write $X = \langle x \rangle$.

Theorem 2.1. Let M (R) be a free module over the special local ring R and let e_1, e_2, e_3 be a basis of the module M (R). Then the points $E_1 = \langle e_1 \rangle$, $E_2 = \langle e_2 \rangle$, $E_3 = \langle e_3 \rangle$, $E_4 = \langle e_1 + e_2 + e_3 \rangle$ generate the coordinate system in the Hjelmslev plane $\mathcal{H}(R)$ answering to the module M (R).

Proof. It is necessary to indicate that the points $\bar{E}_1, \bar{E}_2, \bar{E}_3, \bar{E}_4$ generate the coordinate system in the projective plane $\Pi(\bar{R})$. Evidently the vectors $\bar{e}_1, \bar{e}_2, \bar{e}_3$ generate the basis of the vector space over $\bar{R} = R/I$ and thus vectors $\bar{e}_1, \bar{e}_2, \bar{e}_3$ are linearly independent.
It follows from this that points $\bar{E}_1 = \langle \bar{e}_1 \rangle$, $\bar{E}_2 = \langle \bar{e}_2 \rangle$, $\bar{E}_3 = \langle \bar{e}_3 \rangle$ and $\bar{E}_4 = \langle \bar{e}_1 + \bar{e}_2 + \bar{e}_3 \rangle$ does not lie one line what was necessary to prove.

Conversely

Theorem 2.2. Let E_1, E_2, E_3, E_4 be the coordinate system in the projective Hjelmslev plane
$\mathcal{H}(R)$. Then there is the basis of the module M (R) such that
$\langle e_1 \rangle = E_1$, $\langle e_2 \rangle = E_2$, $\langle e_3 \rangle = E_3$, $\langle e_1 + e_2 + e_3 \rangle = E_4$.

Proof. Let $E_1 = \langle b_1 \rangle$, $E_2 = \langle b_2 \rangle$, $E_3 = \langle b_3 \rangle$ and $E_4 = \langle b_4 \rangle$. Because $\{ b_1, b_2, b_3 \}$ it is the basis of the modul M (R) the vector b_4 can be expressed in the form $b_4 = \beta_1 b_1 + \beta_2 b_2 + \beta_3 b_3$. Denote $\beta_1 b_1 = e_1$, $\beta_2 b_2 = e_2$, $\beta_3 b_3 = e_3$ then the vectors are vectors from the assertion of the theorem.

Lemma 2.1. Let E_1, E_2, E_3, E_4 and E'_1, E'_2, E'_3, E'_4 be the coordinate systems in the projective Hjelmslev plane $\mathcal{H}(R)$. If e_1, e_2, e_3 and e'_1, e'_2, e'_3 are the answering bases of the module M (R) then there is a regular matrix $A = [a_{ij}]$ such that it holds

$$e'_i = \sum_j a_{ij} e_j, \quad i = 1,2,3$$

Proof. Let $X_E = [x_1, x_2, x_3]$, $X'_E = [x'_1, x'_2, x'_3]$. Then

$$x = \sum_{i=1}^{3} x'_i e'_i = \sum_{i=1}^{3} x'_i \sum_{j=1}^{3} a_{ij} e_j = \sum_{j=1}^{3} (\sum_{i=1}^{3} x'_i a_{ij}) e_j = \sum_{j=1}^{3} x_j e_j$$

We get by the comparation

$$x_j = \sum_{j} x'_j a_{ij}$$

The last relation can be written in the form

$$X_E = X'_E A, \quad X'_E = X_E A^{-1}$$

what was necessary to prove.

Let be given the special local ring R. Let us introduce the set Ω such

$$\Omega \cap R = \emptyset, | \Omega | = | I |$$

thus there is a bijective mapping ω such that

$$\omega : I \to \Omega, \ \omega : i \to \omega_i , i \in I$$

where ω_i are „ inverse“ elements to the elements $i \in I$, thus $\omega_i \sim \frac{1}{i}$.

Then the set Ω can be considered as the set „ infinities“ answering to singular elements.
Let us extend the canonical homomorphism Ψ on the set $R \cup \Omega$, put

$$\Psi (\Omega) = \infty$$

We introduce the coordinate system in an affine Hjelmslev plane. Let us assume that the affine plane $\mathscr{A}(R)$ be acquired from the projective Hjelmslev plane $\mathscr{H}(R)$ by the expulsion „infinite“ line, denote its l_∞. We choose the coordinate system in $\mathscr{H}(R)$ such that the points E_1, E_2 lie on the line l_∞. Because $E_1, E_2 \in l_\infty$ then the coordinate system for the line l_∞ is $E_1, E_2, \langle e_1 + e_2 \rangle$. Any point incident to the line l_∞ can be expressed in the form $\langle e_1 + m e_2 \rangle$.
The point which does no lie on the line l_∞ has the expression $\langle x_1 e_1 + x_2 e_2 + x_3 e_3 \rangle$ where $x_3 \neq 0$ it can be considered in the form $\langle x_1 e_1 + x_2 e_2 + e_3 \rangle$. Thus then $X[x_1, x_2]$, $x_1, x_2 \in R$ is any point of the affine Hjelmslev plane $\mathscr{A}(R)$.

Definition 2.5. The affine Hjelmslev plane over the finite special local ring R is the incidence structure $\mathcal{A}(R) = (\mathcal{B}, \mathcal{P}, \mathcal{I})$ introduced by the following way

1. points of $\mathcal{A}(R)$ are an arranged couple $[x, y]$, $x, y \in R$
2. lines of $\mathcal{A}(R)$ are the arranged couple $[k, q]$, $k, q \in R$ and the symbol $[a]$ with the relation of the incidence introduced so

the point $[x, y]$ lies on the line $[k, q]$ if and only if $y = kx + q$
the point $[x, y]$ lies on the line $[a]$ if and only if $x = a$ for $x, y, k, q, a \in R$.

Remark 2.1. The canonical homomorphism Ψ of the ring R on the factor ring $R/I = \overline{R}$ induces a homomorphism $\Psi_{\mathcal{A}}$ of the plane $\mathcal{A}(R)$ into the affine plane $\mathcal{A}(\overline{R}) = (\overline{\mathcal{B}}, \overline{\mathcal{P}}, \overline{\mathcal{I}})$ where it holds

$X \in \mathcal{B}$ then $\Psi_{\mathcal{A}}(X) = \Psi_{\mathcal{A}}[x, y] = \overline{X} = [\overline{x}, \overline{y}] \in \overline{\mathcal{B}}$

$a \in \mathcal{P}$ $\Psi_{\mathcal{A}}(a) = \Psi_{\mathcal{A}}(k, q) = \overline{a} = [\overline{k}, \overline{q}] \in \overline{\mathcal{P}}$

We call the points $X, Y \in \mathcal{A}(R)$ substantially different if $\Psi_{\mathcal{A}}(X) \neq \Psi_{\mathcal{A}}(Y)$.

Theorem 2.3. It holds in the affine Hjelmslev plane

1. $|\mathcal{B}| = |\overline{R}|^2 \, |I|^2 = |R|^2$
2. $|\mathcal{P}| = |R|^2 + |R|\,|I| = (|\overline{R}|^2 + |\overline{R}|)\,|I|^2$
3. any point of $\mathcal{A}(R)$ is incident to $(|R| + |I|)$ lines
4. any line of $\mathcal{A}(R)$ is incident to $|R|$ points
5. any class of the parallelism of $\mathcal{A}(R)$ has $|\overline{R}|$ lines
6. any point (line) in $\mathcal{A}(\overline{R})$ has in $\mathcal{A}(R)$ exactly $|I|^2$ models.

Proof. It follows from the preceding considerations and from the situation in the affine plane.

3. Conclusion

The preceding results are important for the investigation of the combinatorial properties of the affine Hjelmslev plane. The model of the affine Hjelmslev plane was used at the project of the experiments.

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ENVIRONMENTAL ORIENTED ACTIVITIES STUDY IN INDUSTRIAL COMPANIES

ŠTUDIA ZAMERANÁ NA ENVIRONMENTÁLNE AKTIVITY V PRIEMYSELNÝCH PODNIKOCH

Peter MALEGA – Jana ČUCHRANOVÁ

Abstract
This study considers about Environmental management systems of industrial companies. The aim of this theses was gathering as much information as possible regarding selected subject and analysis of technological equipment for the removal of air pollution in company. Based on the economic evaluation of alternatives, it was found that company could make its activities more effective in terms of environmental protection by use of alternative filtration Paint Stop. Annual operating costs of alternative filter device would be 1 987 €, which would save 3,197 € instead of variant using W-filter. [1]

Keywords: environment, environmental management systems, environmentally oriented activities, environmental protection

Abstrakt
Táto štúdia sa zaoberá systémami environmentálneho manažérstva v priemyselných podnikoch. Cieľom tohto príspevku bolo zhromaždenie čo najviac informácií na danú tému a analýza technologických zariadení pre odstránenie znečistenia ovzdušia konkrétnym podnikom. Na základe ekonomického hodnotenia variantov sa zistilo, že spoločnosť by mohla realizovať výrobné aktivity efektívnejšie v zmysle ochrany životného prostredia s využitím alternatívnych filtračných zariadení na farbu. Ročné prevádzkové náklady na prístroj s filtrom budú predstavovať 1 987 €, čo by ušetrilo 3.197 € namiesto varianty použitia W-filtra. [1]

Kľúčové slová: životné prostredie, systémy environmentálneho manažérstva, ekologicky zamerané aktivity, ochrana životného prostredia

Introduction

Environmental protection enters more and more into relatively fixed and stable organizational structure of company management. Rapidly changing legislation in field of environmental management and resulting threat of economic sanctions and loss of image enhance motivation of enterprises to positive changes.

The objective of voluntarily built environment management systems is early identification, prediction and prevention of adverse environmental impacts. [2]

Environmental Management System – EMS

Environmental Management System (EMS) is a summary of concepts and procedures, organizational structures, functions and responsibilities, processes and resources, register of known and observed environmental impacts, direct or indirect. It is a source of specific activities, processes and products, planned or unplanned. [6, 7]

Main usefulness of EMS can be specified by following points [3, 4]:

1. is a tool for reducing cost and increasing competitiveness of production (reduction in insurance costs and charges for pollution),
2. is a prerequisite for obtaining ISO 14001 certification,
3. creates target data and facilitate planning,
4. reduce exposure of violations of laws with criminal and civil legal sanctions,
5. as a means of cost effective management,
6. provides means for objective assessment of business conduct,
7. allows to formulate objectives for environmental performance and business efficiency,
8. promotes environmental awareness of staff and quality objectives,
9. is an important and valuable tool of communication, increasing company morale and creating ethical public relations,
10. meets the criteria of investors and helps improve access to finances for investment.

The environmental behaviour is a management tool which was designed to consistently provide reliable and verifiable information about environmental management behaviour of organizations and efforts to improve it. Norm STN EN ISO 14031 provides requirements and guidelines for the selection of indicators, data collection and analysis and evaluation of the information against environmental performance criteria.

Analysis of environmental activities in the industrial company

Lot of information about technical layout has been gained through observation of work and installation of products and professional consultations with workers of industrial enterprise. Calculation of environmental pollution costs was used to calculate the current situation. The priority was to find out what are the sources of environmental pollution which the company uses and what are the quantities of substances emitted by these sources. Enterprise uses the machines, which are sources of air pollution.

Specifically, the following [1]:

- electroplating,
- paint box
- enamel kiln,
- dry kiln.

After consultation with professional workers of enterprise we were familiar with the fact, that the production company has solid pollutant in spray booth DYNACLEN 3040.

DYNACLEN is a booth for applying coatings to surfaces, painting with projected consumption of organic solvents.

Picture 1 The spray booth DYNACLEN 3040

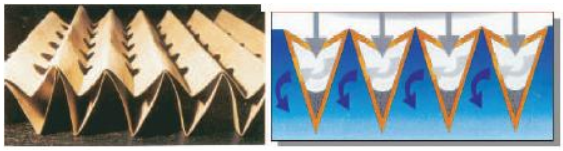
The purpose of spray booth is to channel particle coatings which are sprayed in an area outside the subject, by effective airway suctioning out the employee.

Table 1 Technical parameters of the spray booth DYNACLEN

Booth type	DYNACLEN 3040
Producer	Kovofiniš, Ledeč nad Sázavou
Ventilator type	RSU800-2
Producer of ventilator	ZVVL Milensko
Flow volume [$m^3.h^{-1}$]	3400
Pressure loss [Pa]	1240
speed in cross-section [$m.s^{-1}$]	0,44
Booth dimensions Width x height x depth [m]	4,5 x 2,0 x 3,0
Separation of solid pollutant	W-filter
Frequency of filter replacement	1 of week

Technical equipment DYNACLEN 3040 serves for manual spraying of organic colors and cast iron parts, following by drying and curing of coatings. Parts are manually placed on the conveyor spray, which passing cabs 12D-12 / 1 and 12D-12 / 2, 12D-12 / 3 where worker with spray gun deposited coatings. After that parts pass into a curing oven.

This source of environmental pollution has capacity 4830 pieces of parts per shift. The consumption of paint is 70 kg. For separating solid pollutants we used paper W-filter (FCPN1000) SepaPaint, which is shown in Picture 2.



Picture 2 Paper W-filter (FCPN1000) SepaPaint[1]

The principle of W-filter system is based on labyrinth, which structure diverts air flowing through holes in side walls of W-filter paper. Walls catch wet spray particles. Filter efficiency is 90 %. Filter replacement frequency is every week. Analysis of air pollutants and charges per year 2009 are in table 2.

Table 2 The quantities of air pollution and charges per year 2009

Substance	The measured value of pollutant	∑ The costs of company for air pollution [€]
Solid pollutant	2,4559439	400 €
SO_2	0,173225	11 €
NO_2	0,62997	31 €
CO	0,09545	3 €
HCC(4.sk)	0,37	24 €
CxHy(4.sk)	0,04245	2 €
∑ costs		471 €

∑ the costs were calculated by converse rate

Proposed solutions to improve environmentally-oriented business activities

For the proposal to improve we compared the economic parameters four variants of air pollution. The variants are used in the spray booth DYNACLEN.

Variant 1

In first variant we calculated costs of the enterprise without W-filter paper. Without the its use solid pollutants would be released and related costs are shown in table 3.

Table 3 Leakage of solid pollutant and associated costs

Source of solid pollutant (the booth)	Value of solid pollutant without W-filter	∑ company charges of solid pollutant without W-filter €/Sk
Total amount	4,40675	731 € / 22 000 Sk

Variant 2

In second variant we calculated enterprise costs with useof W-filter paper. Efficiency of the filter is 90 %. In table 4 are quantities of solid pollutant and costs per year 2009 with use of W-filter paper.

Table 4 Leakage of solid pollutant and associated costs

Source of solid pollutant (the booth)	Value of solid pollutant without a W-filter	∑ company charges of solid pollutant with used a W-filter €/Sk
Total amount	0,440675	73,13 € / 2 200 Sk

The costs on the paper W-filter are in the table 5.

Table 5 Annual costs on W-filter

Booth dimensions [m^2]	4,5 x 2,0 = 9 m^2
Quantity of booths in company	8
Number of months when the equipment is used per year	12
The price of W-filter 1m^2	6 € / 1m^2
Replacement of W-filter	1 x per month
Annual costs on W-filter [€]	5 184

Variant 3

If company used an alternative filter system to more protect environment, we can consider various alternatives. In variant 3 a new filter material Paint Stop is used. (Picture 3.)

Picture 3 Paint Stop filter material

Table 6 The Annual costs on the alternative filter material Paint Stop

Booth dimensions [m^2]	4,5 x 2,0 = 9 m^2
Quantity of booths in company	8
Frequency of filter replacement per year	12
Price per 10 m^2 Paint Stop	23 € / 10m^2
Replacement of Paint Stop	1 x per month
Annual costs on Paint Stop [€]	1 987 €

Table 7 Leakage of solid pollutant using Paint Stop and associated costs

Source of solid pollutant (the booth)	Value of solid pollutant without a W-filter	∑ company charges of solid pollutant with used a W-filter €/Sk
Total amount	0,22	36,52 € / 1 100 Sk

Variant 4

Using a combination of filtration equipment Paint Stop and W-filter, amount of solid pollutants and costs are in table (Table 8):

Table 8 Leakage of solid pollutant using a combination of filtration equipment and related costs

Source of solid pollutant (the booth)	Value of solid pollutant without a W-filter	∑ company charges of solid pollutant with used a W-filter €/Sk
Total amount	0,02353	3,90 € / 117 Sk

Economic calculations of all four variants and comparison of annual costs in 2009 reflects Tab. 9. [1]

Table 9 The costs of enterprise to eliminate air pollution in different variants per year 2009

	The annual costs on filtration equipment	The annual costs for quantities of air pollution	Total amount
1.variant: Without the paper W-filter	0 € / 0,– Sk	731 € / 22 000,– Sk	731 € / 22 000,– Sk
2.variant: With the paper W-filter	5 184 € / 156 173 ,– Sk	73 € / 2 200,– Sk	5 257 € / 158 373 ,– Sk
3. variant: With alternative filter material Paint Stop	1 987 € / 59 860 , – Sk	36,52 € / 1 100 Sk	2 024 € / 60 975 , – Sk
4.variant: With combination of filtration equipment	7 171 € / 216 033, – Sk	3,90 € / 117 Sk	7 175 € / 216 398 , – Sk

Calculation of damages for air pollution with paper W-filter is following.

$$\check{S}_o = e_o \sum_{i=1}^{n} u_{oi} \cdot k_{ri} \cdot k_{ni} \cdot k_{ui}$$

uo - quantity of pollutants emitted [t/year]
eo - economic converter [30 ,– Sk/ t]
kr - coefficient of scattering pollutan [0,2 + 4]
kn - the **coefficient of danger** of **pollution** [10 + 80]
ku – character of area [1+8]

Šo = 30 x [0,440675 x(0,2+4) x (10 + 80) x (1 +8)]
Šo = 44 975 Sk

Damage calculated using converse rate
Šo = 44 975 Sk / 1 494 €

Calculation of damages for air pollution with alternative filter material Paint Stop is following.

Šo = 30 x [0,22 x(0,2+4) x (10 + 80) x (1 +8)]
Šo = 22 453 Sk
Damage calculated using converse rate
Šo = 22 453 Sk / 745 €

We can conclude, that filtration equipment Paint Stop would be not only cheaper for the company, but also would be the most acceptable alternative in terms of economic damage to environment.

Conclusion

Based on the economic evaluation of alternatives, it was found that company could make its activities more effective in terms of environmental protection by use of alternative filtration Paint Stop.

Variant 1 (ie without filtration) could appear as the most effective from economic point of view, but considering penalties for contract breach on the use of BAT technologies would apparently reflect as a disadvantage. [1]

Based on the efficiency of filter devices we can quantify and evaluate economic and environmental damages to air pollution. From the calculation and comparison of economic costs of damages from air pollution we cabn conclude that total economic cost would be reduced by up to 50% using alternative filtration Paint Stop over W-filter. [1]

From the work results we can conclude that the filtration equipment Paint Stop would be not only cheaper but for the company also more acceptable in terms of economic damage to the environment.

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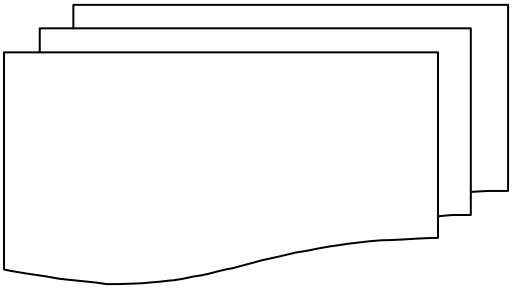

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