relevant results and theoretical developments of science
and research in Central and Eastern Europe

1
2011
issue 1

AD ALTA

Journal of Interdisciplinary Research

AD ALTA: Journal of Interdisciplinary Research
Double-Blind Peer-Reviewed
Volume 1, Issue 1, 2011
Number of issues per year: 2

MAGNANIMITAS ASSN.

AD ALTA: JOURNAL OF INTERDISCIPLINARY RESEARCH

 ISSN 1804-7890
ADDRESS: CESKOSLOVENSKE ARMADY 300, 500 03, HRADEC KRALOVE, THE CZECH REPUBLIC, TEL.: 498 651 292, EMAIL: INFO@MAGNANIMITAS.CZ

ETTN 072-11-00001-01-4
ISSN 1804-7890
AD ALTA IS A PEER-REVIEWED JOURNAL OF INTERNATIONAL SCOPE.
2 ISSUES PER VOLUME.

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GIVEN THE SPECIFIC FEATURES OF THE INSURANCE ACITIVITIES WOULD IT BE REASONABLE APPROACH TO SUBJECT THE IDNUDSTRY TO THE SYSTEMIC RISKS SUPERVISION?

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Abstract: The recent financial crisis has seriously impaired the economic stability and there is a broad consensus that lax supervision and weak regulation contributed to the crisis. As a result, substantial changes in supervision and regulatory environment are going to be implemented. The crisis unveiled that some financial institutions had been so interconnected with other financial companies that they might pose a risk to the whole financial system. Systemic risk supervision is also likely to increase globally. However, it was not proved that insurance industry has been the source or amplified the systemic risk, some segments of the industry were identified as a potential threat of the systemic risk to the financial sector. Therefore the new regulatory rules have been being drafted currently, we can expect that they provide some incentives for more effective operations of the insurance companies.

Keywords: Systemic risk; insurance activity and its systemic relevance; macro-prudential supervision; effective regulation, financial crisis.

Introduction

We have witnessed how increasingly globalized financial markets have become in recent years. This development has fostered concerns for plenty of issues; in fact the most discussed topic in recent months has been dealing with the question to which extent financial globalization contributes to financial instability and crises. The latest financial crisis has raised concerns over the systemic nature of the crisis. Since the economies have become increasingly interconnected and hence interconnections among risks have also moved upward notably, the importance of understanding and managing systemic risks has come into focus. Systemic risks are inherent to every system, not only the financial system. Nevertheless, the universal scope of the latest crisis has raised awareness of the mentioned interconnections and it has revealed the need to think differently about risk landscape.

Financial crisis has shown how urgent the need to reform global financial system has become. It has been clarified that the response to the current financial crisis must be systemic as well as global; i. e. significant improvement of our insights into these interdependencies is a core matter for us to be able to tackle the origins of the crisis and to avoid its eventual repetition in the future. Effective regulation appears to be part of the solution. Systemic risk supervision is also likely to increase globally. Among the many proposals under consideration there is an effort to apply more stringent supervision and onerous regulation to "systematically relevant institutions". Persson (2007, p.1) suggests *"Regulation, supervision, crisis management, and crisis resolution need to be internationally coordinated, in the end, formalized."*

Currently there are plenty of ongoing discussions on addressing systemic risk in insurance and the way the insurance industry should be handled in terms of regulation and supervision. Preliminary considerations have introduced macro-prudential supervision. The main issues concern the problem to what extent insurers and reinsurers should be subjected to systemic risk supervision as some large financial institutions have been so interconnected with other financial institutions recently, that their problems might impair the whole financial system. The most policymakers agree that there is little evidence that insurance industry could pose systemic risks. Nevertheless, some segments of the industry were identified as potential sources of systemic risks; these will be specified later in this paper.

The aim of this paper is to highlight the differences between business models of the banks and insurance companies, to point out the problem arising from applying the same regulation principles to banks and insurers, and to identify the possibilities for regulation of financial institutions that could potentially cause systemic crises.

1. Insures and their performance during the crisis

The insurance industry passed through the crisis quite well and proved its resilience. In addition, (re)insurers have been rather affected by the crisis, than causing main instability problems. For many insurers direct exposure to the epicentre of the crisis, the U. S. mortgages market, seems to have been limited. Those (re)insurers that have encountered the most severe difficulties were hit as a consequence of their own over-exposure to non-core activities. Also a number of concentrated exposures to credit and market risks has been pointed out; i. e. mortgage and financial guarantee insurers or financial conglomerates. In general, the negative impact of the crisis varies on their business models. The highest losses have been experienced by the insurers with large banking operations or exposure to credit risks. This can be demonstrated by the fact that more than 90 % of the total support provided to the insurance industry flew to the few ones with significant banking activities.

Specifically, limited incurred losses have been reported by insurers with limited banking operations. The insurers operating in the frames of this business model have been negatively affected mainly due to mark-to-market decreases in assets valuations, reduced liquidity of certain types of assets, a high level of financial markets volatility and an exposure to the defaulted banks. However, recent higher levels of confidence in finance markets powered by the recovery in assets valuations have almost restored (re)insurer´s capital to its pre-crisis levels.

Bank-insurance conglomerates have been hit much harder. As an example ING can serve. It was provided with more than USD 40 billion in State support. Its problems arose from banking operations, namely the acquisition of the U.S. thrift when performing an expansion of its online savings division. The acquisition subjected ING to the rules of thrift regulation and in order to comply with them, ING had to acquire more than 55 % of mortgages backed securities (MBS). Since the default rates on these mortgages began to rise, the market value of MBS portfolio decreased significantly and ING had to increase the quantity capital they held against the portfolio. Finally, the Dutch government had to take over 80 % of the portfolio. Nevertheless, we should bear in mind that not all the insurers operating in this business model have been hit by the crisis.

Insurers with wholesales banking operations have gained negative popularity. In this group it is AIG which had the largest problems. Most of them arose in their Financial Products division, this division sold credit protection through credit default swaps. The protection buyer does not need an insurable interest in the underlying security; therefore CDS are not considered as insurance products. Hence the Financial Products unit was not supervised by the British insurer´s regulator, FSA. Although, the Financial Products division had always only a small share of the AIG´s revenues, their transactions were highly leveraged. As banks were the most important counterpart for the AIG´s book of business, it has turned out that the AIG could not meet collateral requirements for their CDS. At the end, an intervention by the U.S. Treasury saved the company.

Insurance companies may not be frequent counterparties to credit default swap operations, while the capacity of the sector to take part in these operations is strictly limited by the regulation. Actually, the capacity of insurers to participate in derivative activities varies across different types of jurisdiction; e. g. European insurers are strictly limited to sell but not necessarily to buy credit default swap protection. However, the fact that the AIG was engaged in these non-core activities at such a leverage scale was a factor that has worsened the global

crisis deeply. On the other hand, and rather surprisingly, these operations have caused only a limited damage to the core-insurance business of the company. Nevertheless, the AIG´s problems have pointed out the need for an effective group supervision.

The last group refers to monoliners, these have come under a heavy pressure during the crisis. It has been argued that monoliners have played a large role in generating and amplifying the crisis. Monoliners have quite a different business model from other insurers because they sell financial guarantees for other investors. It has been emphasized that problems encountered by financial guarantors have spread quickly to the banking sector and capital markets as there is a high level of interconnection through the guarantees. Market valuations and rating pressures have played a large role as the trigger of a downgrading spiral. A subsequent downgrading of the various entities presented in this sector has caused a huge wave of downward pressures on valuations of the linked securities presented in the portfolios of many other financial institutions. In fact, a monoliner´s risk profile is quite similar to that of a bank and that is why it has been suggested that a regulation of monoliners should be consistent with the banking regulation.

1.1 Differences in the business models of banks and insurers

There are no doubts that insurers have fared much better during the crisis than banks. The main reasons are fundamental differences in business models of insurers and banks. These have profound implications for the structure of new regulations. The key differences arise in their exposure to liquidity risks as insurers are considered not to be prone to "runs" and there are also fewer interconnections and a lower level of volatility in the industry.

Insurers, especially the life ones, are huge investors and they tend to have longer-term investment horizons than banks; thus their capacity to hold the major part of the investment portfolio until the maturity is much higher, which helps them to overcome short-term market shocks. Insurer´s liabilities consist mainly of reserves for claims, and these usually cannot be withdrawn by policyholders on request, but only when a loss event occurs. Also these liabilities are usually paid out over a prolonged period of time, while the insurer´s assets are usually quite liquid as they must be invested in accordance with regulation rules. On the contrary, there is a high liquidity risk exposure of banks. This is a result of fundamental duration mismatch of the assets and liabilities. The liabilities are represented mainly by the short term funding (often immediately callable), on the other hand their assets are usually long term and represented by loans. Secondly, insurers normally don´t lend each other as much as banks tend to do and that makes them far less interconnected. As the next plausible reason can be mentioned, that insurance companies face different risks in comparison with banks. Banks predominantly fear credit risks, which represent about three quarters of their retained risk. In comparison, credit risk represents less than one quarter or the insurer´s retained risk. As the most important risks for insurers market and underwriting risks are considered. Reinsurers face mainly credit, market, life and P & C underwriting risks.

2. Systemic risks and its significance for the insurance industry

The global crisis 2007-2009 has seriously impaired the economic stability and there is a broad consensus that lax supervision and weak regulation contributed to the crisis. As a result, substantial changes in supervision and regulatory environment are going to be implemented. The crisis unveiled that some financial institutions had been so interconnected with other financial companies that they might pose a risk to the whole financial system. Hence, systemic risks supervision is expected to increase globally. It was not proved that insurance industry had generated or amplified systemic risks; the points of views towards the industry and its role in systemic issues vary significantly. Some theories argue that insurers have not originated and repackaged subprime mortgages and have not acted as major investors in mortgage backed securities, but to the contrary they have presented themselves as the stable industry capable of absorbing market volatility. Others argue that it is the insurance product, the credit default swap (CDS), that has almost brought down the global economy.

As we can observe the opinions differ notably, nevertheless there is broad consensus that some segments of the industry have been identified as a potential threat of systemic risks, and these must be subjected to an additional focus.

2.1. Defining the Systemic Risk

Defining the systemic risk in highly securitized and globalized markets, it is agreed that the systemic risk is created by unexpected events that heighten uncertainty significantly and impairs market liquidity. The created illiquidity leads to price gaps in individual markets and in the pricing of specific assets. Subsequently related stress extends to the funding liquidity of financial institution across the World (Lipsky, 2007, p.1). Mishkin (2007, p.1) defines the systemic risk as *"the risk of a sudden, usually unexpected, disruption of information flows in financial markets that prevents them from channelling funds to those who have the most productive profit opportunities."* Kane (2007, p. 4) argues that *"systemic risk concerns the chance of a system breakdown or devolution. Breakdowns may come from damage that spreads contagiously from one part of network to another or from the disintegration of one or more network connections."*

As we can observe there is no uniform definition of systemic risk. Generally it is understood as the risk of economic disruption that stems from the financial sector and seriously impairs the economy. Most recently referenced definition of the systemic risk is the one from Financial Stability Board (FSB). FSB mutually with BIS and IMF (2009) define the systemic risk as *"a risk of disruption to financial services that is, first, caused by an impairment of all or parts of financial system and, second, has the potential to have serious negative consequences for the real economy*." Fundamental to this definition is that the systemic risk causes negative externalities and/or market failure.

In order to asses and identify the systemically relevant institutions FSB has posted the set of criteria, i. e.: size, interconnectedness, substitutability. IAIS argued that also the speed of a loss transmission should have been concerned. Hence the fourth criterion, time, was added. FSB also specified the set of secondary criteria, which are understood as the contributing factors that might increase a vulnerability of some units, i. e: complexity, leverage and liquidity risk and large mismatches.

Despite the fact that the stated criteria have been broadly accepted, it is important to note that their impact on financial system might differ from different activities. Therefore it is crucial to apply these criteria to the particular activities, not to the institutions. While focusing blindly on the list of the systemically risky institutions may pose additional regulatory burden on some units whilst potentially skipping some units which do carry out activities subjected to the systemic risk. In addition, the Geneva Association warns that this may encourage risk migration, leads to underestimation of systemic risk and creates a moral hazard.

To point out the importance of assessing the institution´s activities as a potential source of the systemic risk, we will try to perform more scrutiny evaluation of the criteria and potentially risky insurance activities. First, we would like to evaluate the criteria towards the systemic risk concerning the whole entity. Subsequently, we will bring up the list of the most discussed and the most frequently raised concerns toward the systemic relevance of insurer´s activities.

Size

Size is a basic measure of the risk. As large insurers tend to be well diversified both geographically and across the lines of

business, they are exposed to the wide range of risks (market, business, insurance risks). Since these risks are highly uncorrelated, the sum of total risks institution faces is smaller than the sum of the individual risks. Usually, the typical large insurer appears to be more diversified than the typical large bank. This can partially explain why insurers have performed much better during the crisis, than banks have.

Nevertheless, the significance of the size for the systemic risk depends on the structure of institution´s activities, its respective importance and possible influences of other systemic risks factors, such as interconnectedness. The Geneva Association highlights that it is not the size that represents the danger, but the undiversified size.

Interconnectedness
Only at condition that the risk can be transmitted, the institution or its activities can pose a risk to the entire financial system. There are several types of interactions and interconnectedness within the financial sector, however apparently identical types of interconnectedness may have quite different effects on the financial system. Reinsurance operations between insurers and reinsurers and the CDS operations between banks can be mentioned as an example. Both activities involve several parties, however, reinsurance transactions can have potential to mitigate the systemic risk, whereas the CDS operations can amplified it. There is no argument that interconnectedness is not relevant factor for the systemic risk assessment, but interconnectedness can be highly important factor for some activities and its relevance to the systemic risk, however for other activities it might represent a little of importance.

Substitutability
Substitutability is assessed by answering the following questions: Whether the institution poses any technical specificities or play such an unique role in the market that it would be impossible to find a substitute in the market in short-run in the case the former unit had ceased to exist. The second question concerns whether the capacity of the company deploys market to such extent that other are unable to enter with the capacity sufficient to enable the market to clear. Following these test, the insurance industry is substitutable and hence not systematically relevant by this criterion.

Timing
Timing of the claims payments takes usually much longer, which has stabilizing effect on insurer´s balance sheets. For example, according to data provided by Swiss Re (2010, p.6) it takes about 9 years to repay 90 to 95 % for medical malpractice liabilities, furthermore, less than half of the claims on World Trade Centre were settled two years after the event (The Geneva Association, 2010, p. 28). As a consequence, insurance books of business can usually be liquidated by regulatory authorities in orderly manner. To the contrary the failure of bank and consequent closer of the wholesale funding markets may immediately trigger a funding crisis and collapse of the banking system very quickly. This makes the process of winding down banks in orderly manner much more complicated. Thus man can argue that insurer´s bankruptcy represents less systemic risk than failure of the bank. However, The Geneva Association notes that according to judgments of the U.S. policy-makers, the difficulties encountered by the AIG FP division presented huge immediate systemic threat. This again highlights the fact that in order to assess the systemic risk relevance, it seems more appropriate to consider rather activities than the institution.

2.2 Application of the criteria the particular activities

In addition, the previous paragraphs have revealed some inconveniences when using these criteria towards assessment the systemic risk concerning the single entity approach. Consequently for the regulatory purposes, to apply these criteria rather to the particular activities that insurers engage than to the single institution appears to be more reasonable approach. There was the scrutiny analysis of the specific insurer´s activities that are interconnected to other parts of the financial system and might have a potential to pose the systemic threat performed in the report on Systemic Risk in Insurance provided by The Geneva Association. The activities carried out by insurers were divided in to 5 categories, i. e. Investment Management activities, liability origination activities, risk-transfer activities, capital, funding and liquidity management, selling credit protection. Next, I will try to summarize the outcomes and point out whether there is a potential of the systemic threat.

Applying the FSB´s criteria to the industry relevant activities we can conclude that typical insurance activities do not pose any systemic risk. However non-core activities have been assessed as a potential treat concerning the systemic risk. These are derivates trading on non-insurers balance sheets, including the CDS trading, the mis-management of the short-term funding raised using commercial paper or securities lending. As potentially systematically relevant activity is considered as well credit protection, namely selling financial guarantees. Thus it has been argued that monoliners should be subject to the same regulation and restrictions as a bank carrying similar activity.

In general, the most frequently discussed are hypothesis whether (re)insurers could cause a systemic failure through direct impact of default on the real economy, their role as a large investor in the financial assets and their interconnectedness to the banking industry. Concerning the impact of (re)insurance companies default, there is an orderly process of resolving the insurer´s liabilities in the most of jurisdictions. By doing so the regulatory authority takes over the insurance company, in the mean time company is not allowed to write any new business. The company´s assets are invested and matched with the liabilities and thus claims can be paid when due. If the insurer´s assets are insufficient to cover all liabilities, the regulator turns to the insurance industry to pay outstanding claims.

Speaking about the second issue, (re)insurers represent one of the most important investor in the financial markets. There were some worries that in the case of distress, the large portfolio shifts by performed by insurers could trigger significant pressure on asset prices and thus to cause financial instability. However, it is broadly agreed that unless forced by the regulatory or accounted rules, insurers don´t tend to sell assets in panic which could amplify asset value declines.

The last issue deals the interconnectedness with banking sector. For instance concerns were raised about possibility of insurer´s massive sales of the bonds issued by banks; however it is agreed that the amount of the bank depending on the insurers for financing is very negligible. As the well known potential channels of contagion are often mentioned derivates and letters of credit, which insurers in most cases purchase. Thus default of insurers will not cause significant harm to the banking industry. However, vice-versa problems in banking sector may have negative impact to insurers.

2.3 Addressing the systemic risk

To mitigate possible systemic threat arising from insurance activities it is inevitable to establish an efficient risk monitoring and to figure out whether the regulations in major financial services jurisdictions are well designed or whether they must be supplemented with new measures.

Since the derivates activities at non-insurance balance sheets and the CDS writing pose a systemic risk, there is a need to mitigate the risk arising from these activities. As a plausible solution appears an establishment of effective group supervision. Under this is usually understood, supervising the international insurers, which are mostly operating within the holding company, or group framework, by one regulator responsible for the entire entity. Thus the capital and liquidity requirements would be laid down for the entire group, based on risks arising from all its activities. Another possible solution for addressing the risk from derivates activities is the idea of establishing clearinghouses. This institution provides clearing and settlement services for the financial and commodity derivatives and securities transactions.

This grants certain level of transparency to the markets and regulators. Addressing the risk arising from the sales of financial guarantees, it is suggested that monoliners should be subjected to the same regulation and restrictions as a bank carrying the similar activity.

The crisis also revealed the need for improvement in liquidity risk management. Since the traditional insurance business does not give rise to liquidity risk, some non-core activities during the period of market stress suddenly needed additional liquidity. It is essential that both the insurers and the supervisors must improve their liquidity risk monitoring and understanding.

Currently, new regulatory systems, based on risk approach and group supervision concepts, are being put in place or have been already in place. Concerning Europe, these are Solvency II and the Swiss Solvency Test respectively. In the U.S. the Dodd-Frank Wall Street Reform and Consumer protection Act were passed lately, these frameworks also address the issue of the group supervision. As the new regulatory changes have been being drafted at the moment, we can expect that they provide some incentives for more effective operations of the companies. Also Enterprise Risk Management have been brought in to the focus, this will intensify the usage of scenarios and stress tests, which should mitigate the probability of any future financial crisis. As the crisis was global, the awareness of establishing effective international regulatory framework increased and to widen cross-border cooperation seems inevitable.

Conclusion

In addition, insurers weathered crisis relatively well, with some notable exceptions. Insurance regulation has been considered to be reasonably adequate however, it is clear that some areas of the supervision and regulation must be immediately improved. This should benefit supervisors, insurers and as well as policyholders. In this point there arises a danger, that in order to create additional safety for policyholders more stringent capital requirements will be implemented. Nevertheless, excessive capital requirements may negatively impact insurance business and hence ultimately hard would be policyholders. Excessive regulation may as well give a rise to competitive distortions, e. g. between companies performing in the different jurisdictions. Therefore careful analysis of the gaps and deficiencies in the regulatory and supervisory frameworks is essential. Since (re)insurers are very unlikely to pose the systemic risk to the financial system, it is assumed that there is no need to subject the insurance sector to the systemic risk supervision. As the insurance sector is impacted by the systemic risk, therefore the introduction of macro-prudential surveillance is broadly accepted.

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Primary Paper Section: A

Secondary Paper Section: AE, AH

SOCIO – EMOTIONAL SKILLS IN WORK ENVIRONMENT

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grant VEGA 1/0831/10: "Social intelligence and perception of a teacher in the school social context"

Abstract: The article deals with the problem of aspects of social and emotional intelligence in work environment. Our aim has been to find answers to whether managers, executive workers and students are socially and emotionally skilled; whether social and emotional intelligence are viewed differently according to sex and whether there are any connections between the mentioned aspects and the age of respondents. The research was carried out by means of the TSIS and TEIQue-SF questionnaires on the sample of 569 participants.

Keywords: social intelligence, emotional intelligence, work environment

1 Social intelligence

We all know one: someone who, after you interact with him or her, leaves you feeling devalued, inadequate, angry, frustrated, or guilty. According to Karl Albrecht (Salopek, 2004), management consultant and author, these are people with low social intelligence. Their opposites are people with magnetic or "nourishing" personalities – people who make you feel good and want to go back for more. Albrecht defines social intelligence as "the ability to get along well with others and to get them to cooperate with you". His model uses a self-assessment to measure social intelligence as a combination of social skills, self-awareness, and interaction style, then helps participants select key areas for improvement. He was meeting people wrestling with the insight issue. People who have high social intelligence don´t understand why everyone doesn´t, he says. However many people haven´t had the occasion to be guided and developed. They lack insight into what their behaviour really is and its impact on other people. They are preoccupied with themselves.

Ever since Harvard´s Howard Gardner put forth his theory of multiple intelligences, social scientists have been exploring each one. Gardner (1993) set the stage and Goleman (1997) explored the first concept. However, social intelligence has never been brought together into a single, cohesive concept. The concept of social intelligence was introduced by Thorndike in 1920 (Ruisel, 2004). The original definition of social intelligence is "an ability to understand and manage men and women, boys and girls and act wisely in relationships". Marlowe (1986) definition is similar, he understands it as an ability to understand people and social interactions and implement the knowledge in leadership and interaction with others, to mutual satisfaction.

Both main components – understanding and ability to act in accordance with social demands have become the bearing solutions of another theoretical conceptions – here belongs trials for operational definition of social intelligence as ability to deal with people. Empathy, social sensitivity, interpersonal judgements belong to another characteristics and constructions which were assigned to social intelligence in 1950´s.

Thurstone (Nakonečný, 1997) defines social intelligence as competence for effective solution of different social problems, whereas he regards social intelligence as a specific feature, relatively independent to general intelligence. It consists of two components:

- perceptive – meaning ability to understand other people, competence for recognition of another person and choosing the suitable way of behaviour towards him/her, with respect to known specialities,
- action, behavioural – ability to act wisely in realtionships; individual way of social behaviour, which fills up specific intentions of an individual.

When delimiting social intelligence, perceptive, cognitive-analytical and behavioural components are being used. In some definitions cognitive component of social intelligence or ability to understand other people are therefore accented; in other definitions the accent is put on behavioural substance (to be able to successfully develop interaction with other people). Another authors more and more rely on psychometric substance and define social intelligence in the meaning of performance measured in tests for social competence.

It is not important how much of social intelligence a person has, but what kind of social intelligence he/she has. Baumgartner, Frankovský (2004) think that usage of behavioural-situational approach to study social intelligence is at least equally productive as cognition, or disposal approach. Allowance for structural approach in relation to the problems is regarded to be one of the most important solutions when theoretical definition. It is the same in relation to methodology of construction of tools for measuring attributes of social intelligence.

Social style is fundamentally who you are, it isn´t going to change much. The two concepts look in opposite directions to increase interpersoanl effectiveness:

- social style is how others see you;
- versatility is how you understand and work with others´ social styles to gain what the company terms "social endorsement".

Points plotted on the four quadrants determine social style (Salopek, 2004):

1. Analytical – ask assertive, control responsive. This person tends to ask queastions, gather facts, and consider data seriously.
2. Driving – tell assertive, control responsive. This person is results oriented and gives limited attention to relationships.
3. Expressive – tell assertive, emote responsive. This person is imaginative, creative, and can generate enthusiasm, but tends to rely on hunches and intuition.
4. Amiable – aks assertive, emote responsive. This person is relationship oriented and looks for personal motives in the actions of others.

Versatility is very changeable, and social intelligence comes into play as well. The complementary dimension of versatility is measured by tendencies in four areas (as identified by a rater group) that together represent a person´s ability to gain social endorsement from others:

1. Image – physical appearance and style that are appealing and appropriate.
2. Presentation – ability to communicate effectively.
3. Competence – skills that gain the respect and confidence of others, as well as such traits as a willingness to take responsibility.
4. Feetback – ability to maximize understanding and minimize tension, and make adjustments accordingly.

While an assessment will reveal a person as one Social Style, versatility is measured on a scale from low to high. We get specific, actionable recommendations on how to improve the workplace performance.

2 Emotional intelligence

The concept of emotional intelligence is very close to comprehension of social intelligence. According to Porvazník (2007) emotional intelligence is connected with qualities of the person, his/her character, temperament, perceptive, creative and

physical (somatic) dispositions. Schulze, Roberts (2007) understand emotional intelligence as psychometric range of intuitively attractive idea that people differ in their emotional skills and that these differences reflect in their real lives. Bar-On et al. (2003) defined emotional intelligence as "complex of emotional and social competence and skills, which help to put up with everyday´s troubles and to be more efficient in both personal and social life."

Salopek (2004) says, that Daniel Goleman in his book "Emotional intelligence: Why it can matter more than IQ", brought emotional intelligence to top of mind and top of marketplace. Emotional intelligence is also back in the news and enjoying renewed credibility. A new study shows that business leaders rank emotional intelligence competencies as more important than traditional leadership attributes to leadership success. Also, in the study "What makes a successful leader", participants were asked to evaluate a set of standard leadership attributes, including emotional intelligence (such as relationship building and self-awareness) and traditional leadership attributes (such as execution and financial acumen). Here are the significant findings:

- vision topped the list of critical leadership competencies across nearly all levels, experience, and personality types; also ranked in the top five are strategic thinking, relationship building, execution, and people development,
- emotional intelligence attributes are viewed as essential to successful leadership, especially the complex capabilities of vision, relationship building, and people development,
- of the remaining attributes, leaders rated all of the EI competencies – including adaptability, optimism, empathy, and self-awareness – as more important than all other general leadership attributes presented.

Emotional intelligence comes from fulfilling conditions of seven problematic fields: self-awareness, self-motivation, persistance, control of impulses, regulation of moods, empathy, hope or optimism. Five wider types of abilities important for emotional intelligence according to Gardner (1993) are:

1. Knowing own emotions – self-awareness; people who are more sure of their feelings can make better decisions in their lives.
2. Handling of emotions – working with the emotions in responsive way; people who lack this ability feel anxious moments quite often, those who excel here can recover faster from shocks and disappointments in life.
3. Ability to self-motivation – emotional self-control: putting off rewards or satisfaction, along with supressing excitable actions, is the essence for being successful.
4. Empathy – as a basic human quality; empathic people are tuned in to react to others´ wishes and needs. That´s why they excel in professions where they can "care" for someone, like teaching, management, or marketing.
5. The art of intepersonal relationships - to be empathic and act in such way, this art is in the background of popularity, dominat position or ability to constructive dealing with people.

Our each emotional quality is to considerable extend created by some habit – when we make an effort, we can change our reactions for better. Emotional competence is achieved through leader´s approach to own personality, improving of interpersonal skills and it results in professional and personal success; this begins with empathy. Person must know his/her own self, his/her own motives and aims, values, feelings and way of thinking – only afterwards he/she can make decisions more freely and purposedly. Right choice and good performance in emotionally demanding conditions characterize success. The tool for harmonizing is creation, such skills as self-motivation, self-discipline, relationships building and empathy. Socially competent person is someone who is able to build relationships without problems, who skillfully recognize reactions and feelings of people, someone who belongs among leaders and organisators – it´s the type of person with whom people feel comfortable because he/she spreads good humour (Birknerová, 2010).

Social interactions in everyday´s life and relationships are based mainly on social and emotional intelligence – their improvement can prevent from existence of many conflicts (Vavrová, 2009). Well-developed social-psychological competence, according to Ferencová, Jurková (2010); Ali Taha, Čverhová (2010), accelerate adaptation to concrete environment and enable active working. Holková, Gyurák Babeľová, Vaňová (2008) agree with opinion that development of these competence depend on level of ability to absorb new knowledge and put them into practice. According to Droppa (2008) development of an individual requires careful study of the surroundings; interpersonal qualities and study of others´ opinions, effort to understand them, support for mutual bonds, teambulding, orientation to further development and helping others´ in their development consists mainly in education, as well as development of other social-emotional competence.

3 Research

The main aim of the research was to discover connections between social and emotional intelligence of our respondents, in relation to their position in organisation, gender and age. Emotional intelligence was measured by TEIQue-SF questionnaire (Petrides, Furnham, 2006) and social intelligence was measured by TSIS (Silvera, Martinussen, Dahl, 2001) questionnaire.

The target group made 297 executive workers, 157 managers and 115 students. The research sample represented 569 respondents, where women (N=414, 72,76%) had bigger representation than men (N=155, 27,24%). The average age of respondents was 27,82; the youngest respondent was 18 years old and the oldest was 55 years old. The collecting of data was being made from January to October 2010. The results were worked out in SPSS statistic programme.

3.1 Research method

For purposes of our research we used two methodologies (TSIS and TEIQue-SF). The social intelligence scale – TSIS: The methodology originated in 2001. It has 3 subscales, each subscale has 7 items in questionnaire, 21 items together. The first scale is Social information processing = SP, second scale is Social skills = SS and the third scale is Social awareness = SA. The authors state the values of Cronbach α for individual subscales: SP = 0,79; SS = 0,85; SA = 0,72 (Silvera, Martinussen, Dahl, 2001). The items are evaluated on 7-points´ scale, where 1 means it refers to me a little and 7 means it refers to me a lot.

TEIQue-SF methodology – questionnaire of emotional intelligence (shortened form): TEIQue-SF, shortened formular, consists of longer form of TEIQue (Petrides, Furnham, 2003) and includes 30 items representing 7-points´s Likert scale, where 1 means I totally disagree and 7 means I totally agree. For each question there are 2 of 15 subscales, which were chosen from TEIQue for integration, and based especially on their corelation with the whole subscales´ score. The model of emotional intelligence successfully integrates and broadens the connected thoughts on emotional intelligence in general scope – consisting of 15 concrete specific aspects: adaptability, control of emotions, low impulsivity, self-motivation, the feature of empathy, assertiveness, expressing emotions, relationships, social awareness, the feature of happiness, emotional appreciation, handling of others´ emtoions, self-respect, coping with stress, the feature of optimism. TEIQue evaluates all above mentioned aspects on 15 subscales. Besides that it provides score on 4 factors of wider importance: satisfaction, self-control, emotiveness and social behaviour. It is important to keep

realizing that the results don´t reflect cognitive abilities (IQ, e.g.), but more self-perceptive abilities and relations´ disposals.

3.2 Results and interpretations

By research we tried to find out connections between social and emotional intelligence in relation to position in organisation, gender and age.

1. Position in organisation

In the first part of analysis we tried to find out differences between position in organisation and subscales of social intelligence, as well as between aspects and factors of emotional intelligence. We used Post-hoc comparison for this purpose. Statistically significant differences were discovered between position in organisation and EQ aspects: self-respect (table 1, graph1), low impulsivity (table 2, graph2), adaptability (table 3, graph3) and factor of self-control (table 4, graph4). Statistically significant differences weren´t discovered between subscales of social intelligence and position in organisation.

On the basis of analysis of dispersion F=3,069, Sig.=0,048 we discovered significant differences in EQ aspect of **self-respect**, in relation to position in organisation.

Table 1: Post-hoc comparisons of average values in EQ aspect **self-respect** according to position in organisation (Tukey HSD)

Position in organisation	Position in organisation	Mean Difference	Sig.
manager	executive worker	0,687	**0,041**
executive worker	student	0,233	0,417
student	manager	0,920	**0,011**

Graph 1: Average values of aspect self-respect according to position in organisation

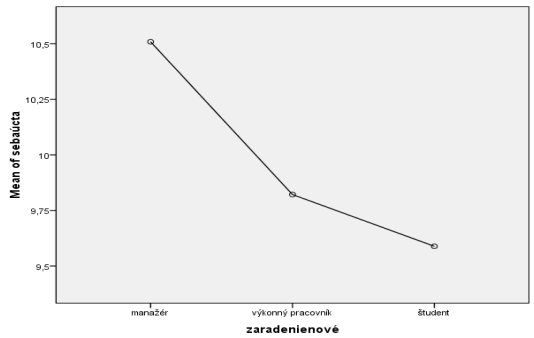
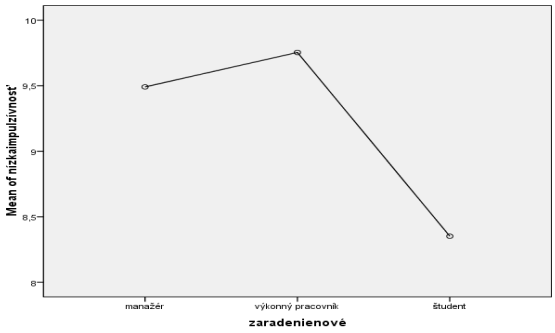


Table 1 and graph 1 show that statistically significant differences in aspect of self-respect exist between managers and executive workers, as well as between managers and students, always to managers´ advantage. The addressed managers know their own value, they have enough self-confidence and respect for their own personality. Generally, they can evaluate their own merits. We also discovered significant differences in EQ aspect of **low impulsivity**, in relation to position in organisation on the basis of analysis of dispersion F=9,684, Sig=0,000.

Table 2: Post-hoc comparisons of average values in EQ aspect of **low impulsivity** according to position in organisation (Tukey HSD)

Position in organisation	Position in organisation	Mean Difference	Sig.
manager	executive worker	0,263	0,484
executive worker	student	1,402	**0,000**
student	manager	1,139	**0,010**

Graph 2: Average values of aspect low impulsivity according to position in organisation



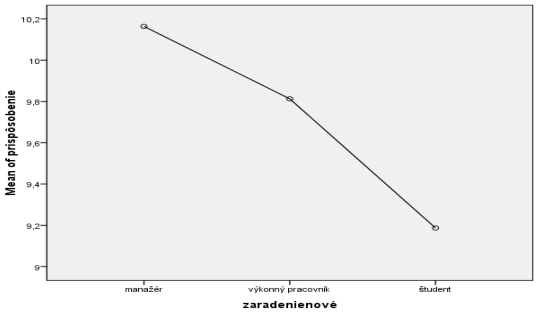
In table 2 and graph 2 we can see that in the EQ aspect of low impulsivity there are statistically significant differences between students and executive workers and also between students and managers, always to students´ disadvantage. Students seem to behave more impulsively than executive workers and managers.

On the basis of analysis of dispersion F=3,620, Sig.=0,028 we also discovered significant differences in EQ aspect of **adaptability**, in relation to position in organisation.

Table 3: Post-hoc comparisons of average values in EQ aspect of **adaptability** according to position in organisation (Tukey HSD)

Position in organisation	Position in organisation	Mean Difference	Sig.
manager	executive worker	0,290	0,351
executive worker	student	0,626	**0,037**
student	manager	0,977	**0,010**

Graph 3: Average values of aspect adaptability according to position in organisation



We discovered statistic significance between students and executive workers and also between students and managers in EQ aspect of adaptability, always to students´ disadvantage. In this aspect of EQ, students can least adopt to existing situations and their surroundings.

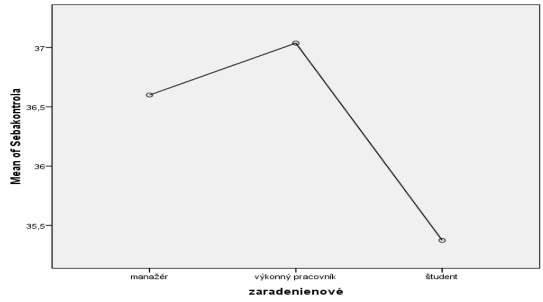
On the basis of analysis of dispersion F=3,443, Sig.=0,048 we discovered significant differences also in EQ factor of **self-control** in relation to position in organisation.

Table 4: Post-hoc comparisons of average values in EQ factor of **self-control** according to position in organisation (Tukey HSD)

Position in organisation	Position in organisation	Mean Difference	Sig.
manager	executive worker	0,438	0,619
executive worker	student	1,664	**0,029**

student	manager	1,226	0,227

Graph 4: Average values of factor of self-control according to position in organisation



Self-control is the basic condition for achieving desired result. Executive workers we addressed have a high level of this factor, in comparison to students. The students should realize that people with insufficient self-control not only don´t have their emotions under control, but also they can´t be perceptive to emotions of others. A person who has the ability to self-control tries to respond to stimuls properly, with regard to probable answer from others.

2. Sex

In the second part of analysis we tried to find out differences between sex and subscales of social intelligence, as well as between aspects and factors of emotional intelligence. We used t-tests for this purpose. Statistically significant differences (table 5) were discovered between age and aspects of EQ: control of emotions, self-motivation, coping with stress, low impulsivity, assertiveness, relationships, adaptability. We discovered statistic significance between sex and factors of EQ: self-control, social behaviour. Statistic significance wasn´t discovered between factors of social intelligence and sex.

Table 5: Statistic significance in the field of gender

Emotional intelligence	Gender	Mean	Std. Deviation	t	Sig (2-tailed)
Control of emotions	**man**	9,45	2,424	2,070	**0,039**
	woman	8,98	2,323		
Self-motivation	**man**	9,16	2,386	1,826	**0,058**
	woman	8,77	2,200		
Coping with stress	**man**	9,52	2,243	2,736	**0,006**
	woman	8,92	2,321		
Low impulsivity	**man**	9,58	2,565	2,095	**0,035**
	woman	9,05	2,623		
Assertiveness	**man**	9,34	2,503	3,561	**0,000**
	woman	8,45	2,600		
Relationships	**man**	9,94	2,355	2,241	**0,039**
	woman	9,49	2,211		
Adaptability	**man**	10,04	2,254	2,066	**0,044**
	woman	9,60	2,285		
Self-control	**man**	37,72	6,150	3,444	**0,001**
	woman	35,76	5,829		
Social behaviour	**man**	38,49	6,360	2,948	**0,002**
	woman	36,54	7,024		

All mentioned aspects and factors of emotional intelligence are statistically significant always to advantage of the addressed men. Knowing own emotions means knowingly discern emotions in the moment of their occurance. When we realize our emotions, it doesn´t mean we aren´t defenceless. Men who are more aware of their emotions, can make better decisions because they know what influenced them – they make their decisions more carefully and stick to them more closely. Men are also, unlike women, more assertive in their behaviour and can handle stressful situations better.

3. Age

In the third part of analysis we tried to find out connections between the age of respondents and subscales of social intelligence, as well as between aspects and factors of emotional intelligence. We used Pearson corelation coeficient for this purpose. Statistically significant connections are presented in the table 6.

Table 6: Connections between age and factors of SQ and EQ

	social awaren -ess (SA)	self-respect	coping with stress	low impulsiv i-ty	Asserti - veness	self-contro l
Age	-,120**	-,090*	,130**	,150**	-,094*	,143**

We discovered connections between the age of the respondents and subscale of social intelligence – social awareness. Negative corelation shows that with increasing age the sensitivity for perception and deciphering of social signals descends. Negative corelation can also be seen between the age and aspects of EQ: self-respect and assertiveness, which alsodescend with increasing age. Positive corelation exists between the age and aspects of EQ coping with stress and low impulsivity. Older respondents cope with stress more easily and they are also less impulsive than younger respondents. Factor EQ of self-control is in positive relation to the age of respondents. Older respondents have their emotions under control and can be perceptive to emotions of others.

Conclusion:

The aim of the presented research was to find answer to question whether managers are socially and emotionally competent and to compare them with executive workers and students. Our intention also was to discover differences between perception of social and emotional intelligence between men and women, as well as among respondents in relation to their age.

Social and emotional competence create our character, they enable us to understand our personal and interpersonal feelings and relationships. The intrapersonal part of emotional intelligence is responsible for our ability to feel positive or negative emotions and command their outward displays. We set the aims, we solve problems or we face obstacles standing in our way. Interpersonal development includes our relationships with other people, social abilities, such as empathy, acceptance of others´opinions and ability to live, work and cooperate with others.

The art of relationships consists in creation and keeping satisfactory relationships, in being adoptable. This is the substance for popularity, dominant position and abilities for constructive working with people. People who are strong in this field are social stars, they can cooperate very well with others. These are the people with whom we feel emotionally well. These people are popular, charming. These people can calm down negative emotions of others – we seek their company in time of distress or when there is some conflict going.

The higher we go in company´s hierarchy, the more important the emotional intelligence is. It creates from 85 to 90% of working profile of top managers. Emotional intelligence meand

intelligent handling of our emotions – communication with people from different cultures, developing sense for unwriten rules and ability to adopt to them. The addressed managers seem to be self-confident people with high level of self-respect - unlike students, who have low level of self-control and adaptability. Executive workers are distinguished mainly by low impulsivity.

Unlike IQ, which is congenital, emotional competence can be improved in each age. We can learn conviction, team-work or self-confidence by training, e.g. When we want to learn something from emotional competence, we must learn from models, practice and repetition. Emotional competence can be developed mainly by young people, where also belong students. Račková (2010) present here the possibility of active work on seminars or lessons, using some innovation form. Ali Taha, Tej (2010) see advantages of such work with students in learning to cooperate with others, developing their creativity, self-assessment and other social-emotional competence necessary for their future profession.

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Primary Paper Section: A

Secondary Paper Section: AN

ON SELECTED ASPECTS OF CRIMINAL LIABILITY OF LEGAL ENTITIES IN THE LEGAL SYSTEMS OF VARIOUS EUROPEAN COUNTRIES

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This article was financially supported by Grant Project No. 41610 called the Criminal liability of legal persons by the Grant Agency of Charles University in Prague.

Abstract: Criminal liability of legal entities has been a modern and topical institution as well as a controversial issue at legal, political and social levels not only in the Czech Republic but also in other European countries. This article briefly describes selected aspects of criminal liability of legal entities – questions of the extent of criminalization and sanctioning of criminal liability of legal entities – and focuses on the regulation of this institution in the legal systems of selected European countries. It also outlines the above-mentioned questions as they are treated in the proposed draft law to regulate criminal liability of legal entities and proceedings against them in the Czech Republic introduced in the Czech Republic in 2011.

Keywords: criminal liability of legal entities, sanctioning, scope of criminalization, punishments, protective measures.

1 Introduction

Criminal liability of legal entities (or corporate criminal liability), not only in the Czech Republic but also in other European countries creating, adopting and regulating this concept of liability in various forms and modes, has been a modern and up-to-date topic, which appears to be controversial at various levels, particularly in legal, political and social fields. After elections to the Chamber of Deputies of the Parliament of the Czech Republic in 2010, a strong political demand for incorporating criminal liability of legal entities into the Czech legal order within a so-called anti-corruption package can be traced. The Czech legislature is the last within the European Union which has no included the institution of criminal liability of legal entities into the legal order in any form although it is bound to do so by many international treaties and European legislation.

2 On the sanctioning of Criminal Liability of Legal Entities

The provision for delictual liability of legal entities to be included in national law is required by dozens of international treaties and laws of the European Union. These documents fail to strictly request that so-called genuine criminal liability be introduced. International treaties generally provide that sanctions applied to legal entities should be effective, proportionate and dissuasive, but they do not explicitly determine that such sanctions should be imposed within criminal proceedings. It should be noted however, that these sanctions in their harshness equal similar sanctions imposed within criminal proceedings; as a result it is sometimes inferred that their imposition may be pursued only at the platform of criminal law.[1] Some international treaties provide for an exemplary list of sanctions. For example, the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions concluded in Paris on 17 December 1997 and promulgated in the Czech Republic as communication of the Ministry of Foreign Affairs (MFA) No. 25/2000 Sb.m.s, requires in its Art. 3 (3) that the proceeds of crime should be subject to seizure and confiscation. The International Convention for the Suppression of the Financing of Terrorism, adopted by Resolution of the UN General Assembly of 9 December 1999 and promulgated as MFS communication No. 18/2006 Sb.m.s., in its Art. 5 (3) provides a financial penalty as an example of punishment. Art. 8 provides for the obligation of states to adopt rules enabling the seizure and confiscation of funds used and allocated for, and the proceeds from, the commission of offence.[2] The Criminal Law Convention on Corruption signed in Strasbourg on 27 January 1999 and promulgated by MFA communication No. 70/2002 Sb.m.s., as amended by MFA communication No. 43/2009 Sb.m.s., requires the adoption of financial penalties (Art. 19 (2)) and a possibility for confiscation and other measures regarding the means and proceeds from criminal activities (Art. 19 (3)). Legislation of the European Union provides in various instruments for the sanctioning of legal entities for committing acts against society. These laws stipulate the duty of Member States to adopt necessary measures to impose upon a legal entity effective, proportionate and dissuasive sanctions, and to provide an exemplary list of such acts. For example, Second Protocol to the EU Convention on the protection of the European Communities' financial interests of 19 June 1997 provides for criminal punishments and other financial sanctions and measures, which must be effective, proportionate and dissuasive (Art. 4). Alternative financial sanctions may include exclusion from entitlement to public benefits or aid, permanent or temporary disqualification from the practice of commercial activities, placement under judicial supervision, judicial winding-up order, seizure and removal of instruments and proceeds of an offence, or confiscation of property the value of which corresponds to such proceeds. The Council Framework Decision of 19 July 2002 on combating trafficking in human beings (2002/629/JHA), in Art. 5, stipulates the sanctions as follows**:** *Each Member State shall take the necessary measures to ensure that a legal person held liable pursuant to Article 4 is punishable by effective, proportionate and dissuasive sanctions, which shall include criminal or non-criminal fines and may include other sanctions, such as:*

> *(a) exclusion from entitlement to public benefits or aid, or*
>
> *(b) temporary or permanent disqualification from the practice of commercial activities, or*
>
> *(c) placing under judicial supervision, or*
>
> *(d) a judicial winding-up order, or*
>
> *(e) temporary or permanent closure of establishments which have been used for committing the offence.*[3]

The Recommendation of the Commitee of Ministers of EC No. 88 (18) of 20 October 1988[4] should be mentioned in this context as it provides for an extensive list of sanctions to be considered by Member States against enterprises; special attention is drawn to the prevention of further commission of crimes. The Recommendation includes the following sanctions and measures:

- *warning, reprimand, recognisance;*
- *a decision declaratory of responsibility, but no sanction;*
- *fine or other pecuniary sanction;*
- *confiscation of property which was used in the commission of the offence or represents the gains derived from the illegal activity;*
- *prohibition of certain activities, in particular exclusion from doing business with public authorities;*
- *exclusion from fiscal advantages and subsidies;*
- *prohibition upon advertising goods or services;*
- *annulment of licences;*
- *removal of managers;*
- *appointment of a provisional caretaker management by the judicial authority;*
- *closure of the enterprise;*

[1] Král, V.: K trestní odpovědnosti právnických osob- východiska, obsah a systematika zákonné úpravy. In: *Trestněprávní revue*. Praha: C.H. Beck, No. 8, 2002.

[2] These conventions are examples of documents that are binding on the Czech Republic and require the introduction of corporate delictual liability into Czech law.

[3] Lists of similar types of sanctions are contained in other Council framework decisions, such as Council Framework Decision of 13 June 2002 on combating terrorism (2002/475/JHA), Council Framework Decision on the strengthening of the penal framework to prevent the facilitation of unauthorised entry, transit and residence (2002/946/JHA), Council Framework Decision of 22 December 2003 on combating the sexual exploitation of children and child pornography (2004/68/JHA), or the Framework Decision of 27 January 2003 on the *protection* of the *environment* through *criminal* law (2003/80/JHA).

[4] Recommendation No. R (88) 18 of the Committee of Ministers to member states concerning liability of enterprises having legal personality for offences committed in the exercise of their activities.

- *winding-up of the enterprise;*
- *compensation and/or restitution to the victim;*
- *restoration of the former state;*
- *publication of the decision imposing a sanction or measure.*

These sanctions and measures may be taken alone or in combination, with or without suspensive effect, as main or as subsidiary orders.

3 The conception of the scope of criminalization of Corporate Criminal Liability

One of the basic issues arising in connection with the institution of criminal liability of legal entities is the various approaches to, and conceptions of, its criminalization, i.e. to what extent legal entities should be held criminally liable for their offences. I do not consider it appropriate to consider basic alternatives suggesting that a legal entity is liable for all crimes as is a natural person, or that it should be held liable only for offences expressly listed in a criminal code or other laws. I argue that the scope of criminalization of criminal liability of legal entities should be subdivided into the following categories where, according to the conception selected, a legal entity is held liable for:

(a) all crimes;

(b) all crimes where the nature of their fault and physical elements permits so;

(c) specially listed crimes, whether included in a criminal code or other laws;

(d) specially listed crimes where the requirement of punishment results from international treaties of European law; and

(e) specially listed crimes with modification of certain elements.

Where the construction of a legal entity being held liable for all crimes is chosen, the primary advantage is that no crime would be omitted. In case further legislative amendments are envisaged the provisions listing the crimes need not be changed or modified. Jelínek correctly points out that the positive value of such alternative subsists in the fact that the chosen concept of corporate legal liability is an integrated one and corresponds to the concept of criminal liability of individuals.[5]
Should the legislature opt for the alternative that a legal entity may be held liable for all crimes, an entity can be found in a position of being criminally liable for acts which it is unable to commit due to the nature of its form (such as bigamy, rape, intercourse between relatives – incest, etc.). What can be considered a downside regarding this alternative is the fact that legal certainty may be weakened as it can be justifiably assumed that bodies responsible for criminal proceedings (the police, prosecution and courts) would have to, at least in the initial stage of application of this alternative, consider whether the legal entity could, or could not, have committed the crime at issue. The weakening of the principle *nullum crimen sine lege* will also arise, particularly in the beginning of the application of the alternative, that a legal entity shall be held criminally liable for all crimes whose nature permits so. Vantuch[6] considers this to be no obstacle since any potential application problems could be solved through case-law. Král considers impractical and redundant the creation of any special lists of crimes for which a legal entity may be held criminally liable.[7]

4 Regulation of the scope of criminalization and sanctioning of Corporate Criminal Liability in the legal orders of various European countries

4.1 Denmark

The regulation of corporate criminal liability in the Danish Criminal Code of 1995 is contained primarily in sections 25-27. Under s. 25 of the Criminal Code a legal entity is punished with a fine where the imposition of this punishment is allowed by the Code or relating legislation. Criminalization of legal entities is provided for in s. 306 stipulating that legal entities are criminally liable for its breach under Title V of the Criminal Code, which systematically subsumes the provision for corporate criminal liability, i.e. including s. 25. In addition to liability for crimes regulated by the Criminal Code, legal entities in Denmark are criminally liable also for breaches of tax assessment laws, the law regulating approved and registered public accounting books, the law regulating measures to prevent the funding of terrorism and money-laundering and dozens of other laws.[8] The amount of the fine to be imposed under the Criminal Code is within the discretion of court as the court is not bound by a minimum or maximum rate stated by the law. Another option allowed by s. 75 (1) of the Criminal Code is to impose a protective measure subsisting in the confiscation of proceeds of any crime or of an amount corresponding to the amount of proceeds either fully or partially. If the amount cannot be sufficiently proved, it is allowed to confiscate such amount, which is likely to equal the proceeds of criminal activities. Under s. 75 (2) it is allowed to seize objects used, or alleged to have been used, for the commission of a crime in order to prevent further criminal activities or where special circumstances of the case suggest so. Instead of confiscating objects, it is permitted by s. 75 (3) of the Code to seize an amount of money, or its part, equalling the value of such objects.

4.2 Estonia

The Estonian Criminal Code, adopted in 2001, expressly designates 133 crimes that can be committed by a legal entity.[9] Where a legal entity can be liable for a particular offence this possibility is stipulated in the last subsection of a section defining the crime at issue, along with the type of punishment that may be imposed upon the legal entity. The Criminal Code allows for a penalty in the form of compulsory dissolution (termination of its existence). Under s. 44 (8) the court may impose upon a legal entity financial penalty between €3,200 and 16,000,000 for a crime committed. The financial penalty may be imposed upon a legal/ entity also as a complementary punishment along with compulsory dissolution. The court, or a special judicial body, may impose upon a legal entity a fine in an amount between €32 and 32,000 for the commission of a less serious crime (s. 47 (2)).[10] Regulation of compulsory dissolution (termination of existence) of a legal entity can be found in s. 46. The court opts for this penalty where the process of committing such offence became part of the regular activities of the legal entity. Sections 83-86 of the Estonian Criminal Code provide for another type of penalty, namely a forfeiture of items of property used for the commission of a crime, or forfeiture of gains from such crime.

4.3 Finland

The regulation of corporate criminal liability can be found in titles 11 - 50 of the Finnish Criminal Code No. 39/1889. Offences for which legal entities may be held liable are listed in the last clause of twenty titles called "Criminal Liability of Legal Entities". Rules of sentencing with respect to corporate criminal liability are stipulated in Title Nine. Sec. 5 allows for a so-called

[5] Jelínek, J.: *Trestní odpovědnost právnických osob*. Praha: Linde, 2007, p. 48.
[6] Vantuch, P.: K návrhu zákona o trestní odpovědnosti právnických osob. In: *Trestní právo*. Praha: C. H. Beck. No. 10, 2003, p. 3.
[7] Král, V.: K trestní odpovědnosti právnických osob- východiska, obsah a systematika zákonné úpravy. In: *Trestněprávní revue*. Praha: C. H. Beck, No. 8, 2002, p. 222.

[8] Töftegaard Nielsen, G.: Criminal Liability of Companies in Denmark. Eighty years of experience. In: Adam, S., Colette- Basecqz N., Nithout M.: *La responsabilité pénale des personnes morales en Europe / Corporate Criminal Liability in Europe*. Bruges: La Charte, 2008, p. 110.
[9] On problematics of the Criminal Liability of Corporations in Estonia Ginter, J.: *Criminal Liability of Legal Persons in Estonia* available at: <http://www.juridicainternational.eu/public/pdf/ji_2009_1_151.pdf> or on the scope of criminalization the Criminal Liability of Corporations in Estonia Ginter, J.: Criminal Liability of Legal Persons in Estonia. A working system still subject to improvement. In: Adam, S., Colette- Basecqz N., Nithout M.: *La responsabilité pénale des personnes morales en Europe / Corporate Criminal Liability in Europe*. Bruges: La Charte, 2008, p. 148.
[10] The division of crimes can be found in s. 3 of the Estonian Criminal Code.

corporate fine to be imposed in Finnish crowns; the minimum amount is 5,000 and the maximum 5,000,000 Finnish crowns (approx. €850-850,000). The particular amount of the fine, as is provided in sec. 6, will depend upon the nature and scope of culpability and participation of the company management (criteria are the nature and seriousness of an offence and the position of the perpetrator of the offence as member of corporate bodies) as well as upon the economic situation of the legal entity (i.e. how big the company is, whether it is solvent, what its income is and other basic indicators of the financial soundness of the company). The Code permits that a so-called common corporate fine be imposed upon a legal entity having committed more than two offences. Sec. 16 Title Two of the Finnish Criminal Code provides that a legal entity can be subject to the punishment of forfeiting financial benefits from, or property used for, the commission of an offence.

4.4 Lithuania

The Lithuanian Criminal Code of 2000 regulates the issue of what crimes may be committed by legal entities in a way similar to that in the Estonian Criminal Code. Corporate criminal liability is explicitly indicated in the last subsection of a respective section defining a particular offence. Today corporate criminal liability extends to, and penalty may be imposed upon legal entities for, some 103 offences. The commission of one offence is subject to just one punishment (sec. 43(3)). Under sec. 43(1) the penalties can be a fine, the amount of which may not exceed 50,000 times the amount of the living minimum (se. 47(4)), restrictions upon the activities of a legal entity, subsisting in the ban on the performance of a particular activity including the closing down of the entity for one to five years (sec. 52), and the dissolution of a legal entity (sec. 53). In addition to one of these penalties, the court may decide on another type of sanction, namely the publishing of the respective judgment of conviction in mass media (sec. 43(2)) or the protective measure of seizing property (sec. 72).

4.5 Latvia

Corporate criminal liability in Latvian law is regulated by the Criminal Code of 1998 in provisions stipulating punishment for legal entities. Criminal liability of legal entities is not explicitly defined but it is derived from so-called compelling measures[11], which govern in detail the way of punishing legal entities. Under s. 70.2(1) a legal entity may be subject to the following compelling measures: liquidation, restrictions on its rights, forfeiture of its property and financial penalty. An entity may also be subject to so-called complementary compelling measures (sec. 70.2(2)), i.e. forfeiture of property and compensation of damage. The Latvian Criminal Code defines liquidation of a legal entity (sec. 70.3) as its compulsory dissolution, dissolution of its branch, agency or any other organizational unit. This punishment will be imposed if the company, or any of its units, was founded in order to pursue criminal activities, or if the company committed a serious or very serious crime. In such situation, assets of the company are forfeited to the state except for assets necessary to satisfy the claims of its employees and creditors and the state. Restrictions on the rights of a legal entity are defined by the Criminal Code (sec. 70.4) as deprivation of a right to carry out business activities, for which a specific state licence or permission is needed under legislation, or a ban on the pursuance of a certain type of activity for a period longer than one and shorter than five years. Forfeiture of property (sec. 70.5(1)) may be imposed by the decision of court and may be specified as forfeiture of the whole property of a company or only of its part. Forfeiture is not applicable to property necessary to satisfy debts of the company against employees, creditors and the state. Forfeiture by its function can be either the main compelling measure or a complementary compelling measure. The fourth compelling measure provided for by the Latvian Criminal Code is a financial penalty (sec. 70.6), the amount of which varies between one to ten thousand times the amount of the statutory minimum wages at the moment of the judgment delivery. If a legal entity commits a serious or extremely serious offence the punishment of liquidation, restrictions on the rights of the entity, forfeiture of its property or a fine may be imposed. In all other cases only a fine may be imposed by court (sec. 70.2 (3) and (4)). Forfeiture as a complementary measure may be imposed where an entity obtained a property benefit as a result of its criminal activity, and the restriction on its rights or financial penalty have been imposed as a basic sanction (sec. 70.5). The court must expressly define in its judgment what assets are subject to forfeiture (subsection (2)). Where the whole property of a legal entity is to be forfeited, claims of its employees, the state and creditors must be satisfied first (subsection (3)). Forfeiture affects also property transmitted to another legal entity or individual (subsection (4)). Compensation of damage caused (sec. 70.7) is described as compensation of physical damage caused as a result of an offence as well as restoration of other interests protected by the law or endangered rights (subsection (1)). Damage must be compensated or restored with the means of the legal entity. Under sec. 70.8, the court considering what compelling measure should be imposed takes into account the nature of the offence committed and the damage caused (subsection (1)). Other factors are provided in subsection (2) as follows: particular conduct of the legal entity, the position of an individual within the bodies of the legal entity, the nature and consequences of conduct of the legal entity, measures taken by a legal entity to prevent the commission of new offences, and the size, type of activity and financial situation of the legal entity.

4.6 Luxemburg

The Luxemburg Criminal Code provides for corporate criminal liability as a result of its amendment passed on 3rd May 2010. Luxemburg and Slovakia are as yet the last Member States of the European Union having passed the relevant legislation. The scope of criminal liability of legal entities covers all types of crime, "crime" or "délit", i.e. more serious or less serious crimes respectively (sec. 34). Certain crimes are explicitly listed under sec. 37 and are subject to special criminalization of up to five times a financial penalty imposed in case of other crimes. The following offences fall into that group: crimes against the security of the state, terrorism, funding terrorism, violation of laws on prohibited weapons in connection with criminal conspiracy or criminal organization, trafficking in human beings and procuration, drug trafficking in connection with criminal conspiracy or criminal organization, money laundering, embezzlement, bribery and corruption in connection with both public interest or so-called private corruption, and assisting in getting unlawful entry or stay in connection with criminal conspiracy or criminal organization.

4.7 Norway

The Norwegian Criminal Code of 1902 regulates criminal liability of legal entities in its Title Three, in particular in sections 48a and 48b. Where it is impossible to punish an individual for a breach of the Criminal Code, a relevant legal entity may be convicted and subject to punishment, namely a fine, or deprivation of the right to undertake business or restriction on such right. The amount of a fine depends, under sec. 48b, on the preventive effect of the punishment, seriousness of the offence committed, whether the legal entity could prevent the commission of the crime through its instructions, training or any other measures, whether the crime was committed in order to enforce some interests of a legal entity, whether the legal entity was awarded, or could have been awarded, any benefit for the commission of the crime; it will also depend upon its economic potential, whether the legal entity, or any other person acting on its behalf, has been punished by some other sanctions as a result of the crime committed including punishment imposed upon an individual. Sec. 48a in fact provides that a legal entity is liable for all crimes. Where an individual acting on behalf of a legal entity violates provisions of the Criminal Code the legal entity on whose behalf the individual acts is subject to

[11] Rone, D.: On Institute of Criminal Liability of Legal Entities in Eight Countries-Nordic Countries and Baltic Countries, p. 7. 2006. This article is avilable at: <http://www.at.gov.lv/files/docs_en/LEGAL%20SCIENTIFIC%20RESEARCH.doc>

the imposition of punishment. This provision applies also in cases where no individual can be subject to punishment for such violation of the Code.

4.8 Poland

Criminal liability of legal entities under Polish law is regulated by Act No. 197/2002 Dz.U. on the liability of collective bodies for acts prohibited and subject to punishment ("OPZK").[12] The Act regulates criminal liability of collective bodies (podmiot zbiorowy in Polish). Under Art. 2 OPZK, a collective entity is a legal entity or an organization without legal personality if it is permitted to have legal capacity under special legislation, except for the Fund of National Property, organizations of local self-government or their unions, state bodies and bodies of local self-government. The concept of a collective entity under the Act covers business companies with a state share, with a share of a local self-government organization or their unions, a limited liability company (public or private), an entity under liquidation, an entrepreneur who is not an individual, and an organizational unit of a foreign legal entity.[13] Articles 7-14 provide for a wide range of penalties applicable to a collective entity. Art. 7 OPZK provides for a fine (kara pieniężna) of between PLZ 1,000 and 20,000,000 but not more than 10% of the income earned in the relevant fiscal year when unlawful activity giving rise to criminal liability of a collective entity was performed.

Under Art. 8 OPZK, forfeiture may apply to: (1) an item of property directly or indirectly resulting from unlawful conduct, or an item serving, or intended to serve, for the commission of unlawful activity; (2) a property benefit directly or indirectly resulting from unlawful conduct; or (3) an equivalent of the value of an item or property benefit directly or indirectly resulting from unlawful conduct.

Art. 9 OPZK lists 6 other types of penalty that may be imposed for a term of one to five years, except for the punishment of publishing a judgment of conviction. These are: (1) ban on the promotion or advertisement of the activity pursued; (2) ban on obtaining subsidies, grants and any other form of financial assistance from public funds; (3) ban on obtaining assistance from international organizations to which Poland is a party; (4) ban on applying for government contracts; (5) ban on operating the main or subsidiary lines of activities – this penalty may not be imposed should it result in the liquidation or bankruptcy of a collective entity, or in the lay-off of employees; and (6) publishing the judgment of conviction. Art. 10 OPZK regulates criteria to be considered by the court in decision-making with respect to the imposition of a fine, bans or publishing.

Art. 12 OPZK provides for a possibility, in specially justified cases, of not imposing a fine or the punishment to publish a judgment of conviction. Art. 13 OPZK provides that a financial penalty may be increased by up to one half where the collective entity commits a new unlawful act within 5 years of sentencing. Art. 16 provides that a legal entity is criminally liable for the offences listed in the Act and for the violation of provisions in specified legislation, i.e. in the total of 16 other laws listed in this Article. These laws cover, for example, the Banking Act, the Bond Act, the Act regulating public trading in securities, etc.

4.9 Austria

Criminal liability of legal entities was introduced in Austrian law by the federal Act on the liability of associations No. 151/2005 BGBI [14] („VBGB"). Sec. 1(1) stipulates that legal entities are liable for any offence defined in the Criminal Code and in so-called subsidiary laws. Any conduct is a crime for which a criminal punishment may be imposed under land or federal legislation.[15] The Austrian regulation of punishing associations (Verband), which encompass, under sec. 1(2) VbVG, legal entities such as stock corporations and limited liability companies, partnerships, registered trading associations, and European economic interest groups, is based upon the monism of criminal sanctions since the only applicable criminal penalty is a fine (Verbandsgeldbuße) . The fine is assessed in daily rates (Tagessätze), starting with a one day rate. Sec. 4(3) VbVG determines the number of daily rates (from 40 to 180) depending on the seriousness of an offence expressed as the duration of a term of imprisonment. The number of daily rates is regulated as follows: 180 – punishment will be life imprisonment or imprisonment for the term of up to 20 years; 155 – a term of imprisonment of up to 15 years; 130 – a term of imprisonment of up to 10 years; 100 – a term of imprisonment of up to 5 years; 85 – a term of imprisonment of up to 3 years; 70 – a term of imprisonment of up to 2 years; 55 – a term of imprisonment of up to 1 year; 40 – in all other cases. Provisions of sec. 5 VbVG also provide for an increase (subsection (2)) or decrease (subsection (3)), depending upon aggravating or mitigating circumstances respectively. A daily rate under sec. 4(4) VbVG is determined according to the gains of an entity with regard to its economic efficiency. The rate is set in the amount corresponding to 1/360 of yearly gains, but it may, as suggested earlier, be increased or decreased. The lowest amount determined by court is €50, the maximum being €10,000. Should an association serve community interests, humanitarian, religious or other non-profit purposes, its daily rate is between €2-500.

Sec. 6 VbVG regulates conditional suspension of a fine. If an entity is punished by a fine not exceeding 70 daily rates, a probationary period may be imposed for the duration of one to three years with a possibility to impose other duties (such as the duty to compensate damage caused by the entity, unless the entity has done so; a duty to arrange for technical, organizational and personal measures in order to prevent the commission of other crimes for which the entity may be held liable provided the entity agrees so), where it may be reasonably assumed that the conditional suspension of a fine will suffice to prevent the entity from committing further crime, and that there is no need to execute the fine in order to prevent the crime in relation to activities of other entities. If the entity observes imposed duties and instructions, the fine will be conditionally discharged. Sec. 7 VbVG provides for conditional discharge of part of the fine. Such an amount of the fine will be at least one third of the initial amount but no more than five sixths. The provision for a probationary period of one up to three years and the imposition of duties applies (sec. 8 VbVG). Sec. 9 regulates the withdrawal of a conditional discharge of the fine if an entity commits other criminal activities during the probationary period, or fails to obey instructions and fulfil duties imposed under sec. 8. In such cases the court either cancels the conditional discharge of a fine or imposes a new probationary period not exceeding five years along with new instructions and duties.

4.10 Slovakia

Slovakia incorporated a so-called quasi-model of criminal liability of legal entities into its legal order in 2010. Initially, corporate criminal liability should have been included in the Criminal Code No. 300/2005 Z.z. within its recodification. This alternative was later abandoned and the legislature intended to adopt a separate law on criminal liability of legal entities in 2006. There were two draft laws introduced within the legislative procedure to the Slovak Parliament – the National Assembly – but neither was passed.[16] However, Act No. 224/2010 Z.z. was passed on 27th April 2010 amending the Criminal Code No. 300/2005 Z.z. The amendment introduces so-called quasi corporate criminal liability: it is assumed that, as a result of an offence committed by an individual, a protective

[12] Ustawa z 27 września 2002 r. o odpowiedzialności podmiotów zbiorowych za czyny zabronione pod groźbą kary (Dz.U. Nr 197, poz. 1661, ze zm.).
[13] Jelínek, J.: *Trestní odpovědnost právnických osob*. Praha: Linde, 2007, p. 181.
[14] Verbandsverantwortlichkeitsgesetz.
[15] On Austrian regulation of the scope of the criminal liability of corporations Jelínek, J.: *Trestní odpovědnost právnických osob*. Praha: Linde, 2007, p. 198 or Príbelský, P.: Trestná zodpovednosť právnických osôb v Rakúsku. In: *Trestněprávní revue*. Praha: C. H. Beck, No. 1, 2007, p. 13.
[16] Both the private member´s bill (print No. 1523/2006) and the Government bill (print No. 1507/2006) regulated a wide range of punishments in more or less the same manner. The following sanctions were proposed: financial penalty between SK 50,000 and 500,000,000, dissolution of a legal entity, forfeiture of property, forfeiture of an item of property, ban on specified activities, ban or restriction on obtaining public subsidies or grants and ban on the participation in public tenders, publishing the judgment of conviction; protective measures were also proposed, such as the forfeiture of an item of property and the court supervision over the activities of a legal entity.

measure may be imposed on a legal entity if the commission of such offence is linked with the activities of the legal entity. The first protective measure under sec. 83a is forfeiture of money in the amount between €800 and 1,660,000. The second measure is forfeiture of property under sec. 83b.

5 The latest development of the issue of Corporate Criminal Liability in the Czech Republic

5.1 Brief comment on the legislative development

The Czech Republic has not introduced criminal liability of legal entities into its legal order. In 2004 a Government bill on criminal liability of legal entities and proceedings against them was unsuccessfully introduced to Parliament;[17] four years later in 2009, the Government passed a resolution entitled "An analysis and international comparison of legal regulation of legal entities and their conduct subject to punishment under international treaties",[18] which formed the basis for the preparation of a draft law to regulate criminal liability of legal entities and proceedings against them[19] on the platform of criminal law. The draft was slightly modified by the Ministry of Justice and reintroduced at the end of 2010.[20] The Government approved the draft law regulating criminal liability of legal entities and proceedings against them on 23rd February 2011; the bill is now in the Chamber of Deputies of Parliament of the Czech Republic as Print No. 285 of 2011. The effect of the bill is proposed to commence on 1st January 2012.

5.2 On the issue of punishment as proposed in the draft law regulating criminal liability of legal entities and proceedings against them of 2011

Sanctions, as proposed by the bill ("zTOPO"), are punishments and protective measures; they are provided in Part Three in sections 14-23. Sec. 14 zTOPO defines criteria under which types and rates of punishments are determined; a negative definition of the imposition of a protective measure can also be found there. The bill allows for the imposition of the following wide range of eight types of punishment:
a) dissolution of a legal entity,
b) forfeiture of property,
c) financial penalty,
d) forfeiture of an item of property or any other property value,
e) ban on pursuing specified activities,
f) ban on participation in government contracts, licensing procedure or public tenders,
g) ban on obtaining subsidies and grants, and
h) the publication of the judgment of conviction.

Protective measures are seizure of an item of property or any other property value (sec. 15). Under sec. 15(3), punishments and protective measures may be imposed simultaneously except for a financial penalty in combination with forfeiture of property, and the punishment of forfeiture of an item of property or any other property value in combination with the protective measure of seizure of a property item or other property value. Dissolution of a legal entity is proposed to be imposed upon a legal entity having its registered office in the Czech Republic where its activities subsisted fully or primarily in the commission of one or more crimes. However, this punishment is proposed not to be imposed upon political parties or political movements. Requirements for the forfeiture of property are defined in sec. 17; this punishment is proposed to be imposed upon a legal entity for the commission of a very serious offence by which the entity sought to gain property benefit for itself or for another (subsection (1)). These requirements are not obligatory only in case the Criminal Code expressly provides for the imposition of such punishment (subsection (2)). Sec. 18 provides for a financial penalty whose imposition may not be detrimental to the rights of the injured (subsection (1)). It sets a daily rate between CZK 1,000 and 2,000,000. In order to properly determine the amount of a daily rate the court should take into account the property circumstances of a legal entity, in particular what things or means are absolutely necessary for carrying out its activities (subsection (2)). The court may, under sec. 19, decide on the imposition of forfeiture of a property item or other property value including substitute value in compliance with the requirements stipulated by the Criminal Code. The ban on pursuing specified activities of a legal entity may be imposed for a term between one and twenty years if the crime committed was linked with these activities (sec. 20). The ban on participation in government contracts, licensing procedure or public tenders may be imposed if the legal entity committed a crime in the course of making or performing such contracts and procedures or in the course of its participation in public tenders (sec. 21); the ban on obtaining subsidies and grants maybe imposed where the legal entity committed a crime in connection with its application for, disposing of, using or providing grants, subsidies or financial assistance (sec. 22). The publishing of a judgment of conviction is stipulated in sec. 23; the court decides so if it appears necessary that the public be aware of conviction. The court specifies the type of media where the legally effective judgment of conviction should be published (subsection (1)) at the expense of the legal entity (subsection (2)).

5.3 The scope of criminalization as proposed in the Bill on criminal liability of legal entities and proceedings against them of 2011

Consideration of the extent and scope of criminalization of corporate criminal liability was quite extensive; at the end, the alternative of liability for listed crimes was chosen in the bill. Originally, two alternatives were debated. *Alternative I* – finally selected – provides for a list of crimes which may be committed by a legal entity (sec. 8 zTOPO); the list is reduced to crimes required to be covered by delictual liability of legal entities by international treaties and EU legislation. The total number of 74 crimes is extended with tax crimes.[21] The choice of this alternative can find its support in academic literature.[22] The model containing a list of selected crimes with a certain modification of their elements is considered appropriate by Král[23] and is supported by Jelínek.[24] Such modification can be presumed with respect to certain crimes, for example, due to the violation of public interest. *Alternative II*, which was not chosen, considered as crimes for the purposes of zTOPO felonies and misdemeanours regulated by the Criminal Code unless their commission by a legal entity was excluded due to the nature of the legal entity. The bill contains two groups of opinions on the scope of criminalization of criminal liability of legal entities; however, at the time of submission of this article it was unclear which of them would be selected and preferred in support of the alternative chosen.

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[17] Print No. 745 of 2004.
[18] Government Resolution No. 1451 of 30th November 2009.
[19] The draft was submitted under Resolution No. 1451 of 30th November 2009 and can be retrieved in the Czech language from http://eklep.vlada.cz under reference number of the sponsor of the bill 700/09-I, which is the Ministry of Justice.
[20] This article describes the circumstances of the bill as applicable on the day of its submission, i.e. after the bill successfully went through the legislative procedure in the Government and is awaiting its consideration by Parliament.
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Primary Paper Section: AG

GENDER AND ITS RELATIONS WITH COGNITIVE STRUCTURING AND UNCERTAINTY

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Abstract: In our contribution, we try to fill up the content of gender concept in the context of acceptation of dichotomy instrumentality versus expresivity. We focus on specific cognitive variables and their potential to saturate typically (stereotypically) defined characteristics of masculinity and femininity. We were thinking of optimal combination of masculine and feminine features in relation with cognitive structuring of information affecting on humans, their need and ability to settle up with permanent information agency.

Keywords: masculinity, femininity, androgyny, need for cognitive structure, ability to achieve cognitive structure, uncertainty, certainty.

1 Masculinity, femininity and gender segregation

Gender can be understood as a social and cultural construct, a set of ideas and beliefs about how to behave, to present what roles they should have, what the men and women should be like (Lukšík, Supeková, 2003).

Masculinity and femininity as cardinal components of gender are social and cultural constructs that have been changed throughout the history and they have acquired different forms in various cultures. As mentioned in Lukšík and Supeková (2003), a man was considered being a dominated model in 18th century (one sex model). At the end of 19th century the man and woman were considered complementary beings. Now, there are valid two models in a society. The first model is the permeation into the other sex (man-like women, woman-like men), uncertainty and transitional forms of sex, or exemption from sex (androgyny). The second model is the convergence of the ideal woman as a model and a man as an athlete or a hero.

The vision of who the man and woman are, what unites them and what divides has been changed in the science and now we can identify three paradigms of the genus investigation (Bačová, 2009):

1. *Examination of gender differences* (1894-1936 – onwards)
   Research in this period was focused on examining differences in mental abilities and verified the relationship between biological sex and intellectual abilities. No differences were detected between men and women in general intelligence. Work in the inter-individual differences experienced renaissance in 70´s of 20th century, but the results again showed minimal differences between men and women in the intellectual, emotional and socio-relational fields.

2. *Gender as a personality variable* (1934-1982)
   Masculinity and femininity were introduced into the psychology as general, global and contradictory personality traits in the years 1936-1954. Femininity is, according to this model, natural for women and not for men, masculinity is natural for men and not for women. Masculinity and femininity were seen as personality traits, as essences, as the extract of masculinity and femininity that governs human behaviour.
   In 1954-1966, the research was focused on the development of "sex roles", when the girls and boys become men and women. Interest of man-researchers and women-researchers has been focused on processes of identification with same sex parent, learning the roles and combination of these processes. This trend was followed up in 1966-1974 by works of men and women „sex typing“. In the years 1974-1982, after a period of intellectual criticism in the 60´s, there was proposed model of psychological androgyny as a personality type that combines and balances the masculine and feminine quality (Bem, 1974). The starting point of paradigm "gender as a personality variable" is that sex and gender are represented in individuals as quantities of personal qualities of masculinity and femininity. The key question remains, however, measurement of this quantity.

3. *Gender as a social category* (since 1982)
   Comparing the previous period, this period and paradigm maximize the differences between men and women. A turn from a personal variable to the social category is associated with the names Sandra L. Bem and Carol Gilligan.
   Bem (1981) introduced together with other men-scholars and women-scholars into psychology the term of a gender scheme as a generalized predisposition of a person to process information about social and psychological world through masculine and feminine genders. A view to gender as a scheme was a turn from essence to cognitive representation. The problem of this concept is conceptualization of human-being as a passive recipient of social impacts that do not have the opportunity to actively participate in shaping their own gender (Hoffman, Borders, 2001).
   Gilligan (1982 in Bačová, 1999) has risen in her work three topics:
   - Survival and women's experiences are different than men experiences and survival. Therefore, women should be examined by their own standards.
   - Men and women form different global 'I' and different moral positions and principles. Male´s "I" is characterized by separateness and female´s "I" is characterized by interconnection.
   - Meaningful significant differences between men and women can and should be viewed positively. Methods of cognitive and moral evaluations of women are not inferior; they are part of humanity's access to basic human questions.

   If we understand gender as a social category, we have to remember the implications arising from this conceptualization:
   - Social representation surmounts simple reflection of gender as the only biological issue. It understands gender as a complex social and psychological phenomenon.
   - Gender contributes to contest the tendency to explain survival and action of people from their stable internal qualities. Gender comes not only from the core but also outside.
   - We need to consider gender in social and developmental context. Gender means at different life periods and in different life situations, something else. Gender is a historical and dynamic.
   - Children learn masculinity and feminine from their culture, but also from specific people and specific relationships. That all has its point of intersection in the individual. Men and women and what gender means to them, cannot be omitted when considering the gender.
   - The perception of gender as a social category adds to the traditional quantitative methodology qualitative processes and methods.

For the differentiating purposes of masculine and feminine roles, there are often used relatively simple dichotomizes that define male and female "fundamentals". Probably the most common dichotomize is a dimension of instrumentality versus expressivity that for example Stake uses in his work (1997) in response to Angyal (1965), Spence (1974) Guisingera, Blatta (1994). Stake (1997) defines expressivity as a feminine feature. In sociological or socio-psychological sense, we could characterize the instrumentality of a masculine role by focusing on the leading and decisive powers in the person of a husband-father and expressiveness of feminine role with care and meeting

the emotional needs of family members through the wife-mother (Renzetti, Curran, 2003).

Ward (2000) uses categories „need for affiliation" and „need for achievement" to mark instrumentality and expressiveness, while their semantic content is understood like Stake.

Conway (2000) has done the research, where he focused on antagonistic categories – communality and agency. He has found out that participants attributed higher status to individuals with higher value "agency" (with instrumental behaviour) and lower status to individuals with higher value "communality" (with expressive behaviour).

Hofsede (1998) points out that dimension masculinity - femininity is sometimes understood wrongly as contradictions individualism - collectivism (I versus we) and argues that the dimensions of individualism - collectivism and masculinity - femininity are independent. Therefore, he suggests in his work to characterize the masculinity by a term ego enhancement and the femininity by a relationship enhancement.

On this basis, we can see that in our socio-cultural organization of the world we prefer model of sex-gender roles that are clearly defined for both women and men. We constantly attempt to structure female-male worlds as two separate realities, which inevitably lead to gender segregation.

As reported by Maccoby and Jacklin (1974 in Badinter, 1999), sexual segregation is saturated by biological factors, socialization and cognitive factors.

Biological factors have genetic and morphological features, which structure four levels of manifestation of sex. There belong genetic sex, gonadic sex, physical sex, and finally the external and internal genital organs together with secondary sexual characteristics, which we refer to as a civil sex (Badinter, 1999). On this basis, we are able to identify biologically given sex.

Socialization is a process we can look at, in terms of gender formation, through the various theories. An example is the psychoanalytic theory, cognitive-developmental theory, social learning theory and others.

Cognitive factors belong to area which is explored the least (Badinter, 1999). They represent not only elementary but also complex processes of cognitive information processing, from the perception (special social perception), discrimination up to structuring of stimulus material, mental representation and decision-making (especially in gender specific situations).

2 Cognitive structuring

We would like to enrich this field by a specific issue related to cognitive structuring in relation to uncertainty, or certainty. Our perception of cognitive structuring is based on work of Bar-Tal (1997), who understands the cognitive structuring as a two-dimensional orthogonally arranged concept consisting of two cardinal variables, namely from the need for cognitive structure and the ability to achieve cognitive structure.

Bar-Tal (1997) understands the variables as follows - the need for structure is defined as the preference of cognitive structuring, which is understood as (1) opposite to the piecemeal processing of information and (2) means leading to a sensing of certainty.

The ability to achieve cognitive structure relates to how the one is able to utilize the process of information processing, which is consistent with its need for cognitive structure. In the case of a high need for structure, it regards to (1) avoidance of information that the one cannot categorized in accordance with existing knowledge and (2) organizing of knowledge the way to be adapted to existing cognitive structure. In the case of a low need for structure, it regards to (3) active and systematic understanding of all available information. In general, the ability to achieve cognitive structure can be defined as the ability to use its categories the same way as analytical information processing in accordance with the tasks that are the man asked.

Need for cognitive structure and ability to achieve cognitive structure are components of cognitive structuring process, which combination we can get four types related to processing of information:

- Low need for structure - low ability to achieve cognitive structure (in research is used abbreviation LPNS – LAACS),
- Low need for structure – high ability to achieve cognitive structure (LPNS – HAACS),
- High need for structure – low ability to achieve cognitive structure (HPNS – LAACS),
- High need for structure – high ability to achieve cognitive structure (HPNS – HAACS).

Particular characteristics of mentioned types are displayed in Table 1.

3 Uncertainty

Studies with uncertainty (Sarmany - Schuller, 1999) pointed to the fact that uncertainty is a phenomenon closely linked with the ability to categorize and structure the world (about the world).
Every person has a need for certainty, which is manifested in individual specific rate. Inability to meet such an important need, such as the need for certainty may lead to a feeling of losing control and stress (Paterson, Neufeld, 1987 in Bar-Tal, 1994). In accordance with Kruglansky's words (1988 in Bar-Tal, 1994), the need for certainty is a desire for knowledge that reduces ambiguity, doubt and confusion. The need for certainty activates epistemic activity based on categories and a piecemeal process is unused (Fiske, Linville, 1980, Fiske, Pavelchak, 1986 in Bar-Tal, 1994).

Uncertainty is a phenomenon directly related to inadequate form of processing the complaints stimuli through simple cognitive categories, representing static system that ignores relevant information influencing a person, or its cognitive system. From the perspective of Piaget's concept of intelligence, we could adequately categorize people with limited ability and to structure information about the world and to consider these people being unintelligent. These people are capable of processing information only based on existing categories, they do not permit their change, extension or their completely reorganizing to match the known experience.

4 Research

In our research we were interested whether sensing of uncertainty determined by a process of cognitive activity is associated with masculinity and/or femininity. To fulfil the objective of this research, we have chosen the following methodology:

Personal Need for Structure PNS (authors: Thopson, Naccarato, Parker, 1989) – questionnaire consists of 12 claims that are reviewed by 6-point scale. Items of questionnaire are designed to show the way of processing and organization of information, stereotyped reactions, external clues in the establishments of decisions, the processing of inconsistent information, efforts to enrich the existing knowledge (Hess, 2001). There are three scales in the output for statistical analysis: the desire to structure, a response to lack of structure and need for structure.

Ability to Achieve Cognitive Structure Scale AACS (author: Bar-Tal, 1993) – questionnaire consists of 24 claims that participant reviews by 6-point scale. Items of questionnaire show 4 fields: easy usage of cognitive structuring, difficulties with using of cognitive structuring, easy to use piecemeal processing information, and difficulties in usage of piecemeal information processing (Bar-Tal, Rabin, Tabak, 1997). The output is a single number that characterizes the ability to achieve cognitive structure.

Table 1: Combination of need for cognitive structure and ability to achieve cognitive structure

		Need for cognitive structure	
		Low	**High**
Ability to achieve cognitive structure	**Low**	Low level of piecemeal structuring	Low level of cognitive structuring
		Unintended information processing	Hypervigilance
		Dysfunctional impulsivity	Low self-efficiency
		Low self-efficiency	High uncertainty
		High uncertainty	Obsessions, compulsions
		Frequent use of stereotypes	High sensitivity
		Low level of stress	Less frequent use of stereotypes
			Very high level of stress
	High	High level of piecemeal structuring	The high level of cognitive structuring
		Intended information processing	Unintended information processing
		Vigilance	Functional impulsivity
		High self-efficiency	High self-efficiency
		Low certainty	High certainty
		High level of stress	High level of repression
			Frequent use of stereotypes
			Low level of stress

Questionnaire of Uncertainty - Certainty U-C (author: Kováč, 1969) – questionnaire consists of 54 items with alternatives a) and b). Participant is supposed to decide between these two alternatives. If he/she is no able to choose any of them, he/she can choose the alternative c), which is not valid according to this methodology. The output for statistical processing has 5 scales which are at the same time the levels of uncertainty – certainty: normal uncertainty, increased uncertainty, pathological uncertainty, normal certainty and abnormal certainty.

The Scale of Masculinity and Femininity SMF (author: Kusá, 2000), this scale consists of 45 items which are divided into three categories: masculinity, femininity, demanding. Items shift regularly and participant has 6-point scale available for his/her decisions. The output for statistical processing has three scales: scale of masculinity, femininity and demanding.

Personal Attributes Questionnaire PAQ (authors: Spence, Helmreich, 1978) this questionnaire consists of 24 items questionnaire we use 16 items. Participant reviews items on a 5-point scale. The output for statistical processing have two scales: scale masculinity, femininity.

The total number of participants was 162, including 73 men and 89 women. 81 out of them we could characterize by masculinity or femininity as a „pure" gender type. Therefore research sample consists of 81 participants.

Consistent with theoretical models of gender, cognitive structuring and uncertainty, we hypothesized that:
H1: masculine people can be characterised with high ability to achieve cognitive structure.
H2: masculine people can be characterised with high certainty.
H3: feminine people can be characterised with high need for cognitive structure.
H4: feminine people can be characterised with high uncertainty.

To test our hypothesis we used the calculator of probability to test the difference of cognitive structuring types point values (Table 2) and Mann-Whitney U-test to test the gender differences in uncertainty and certainty (Table 3). As a critical statistical value which indicates the statistical significance, we appointed the standard value of p = 0,05.

Table 2: Gender differences in a relationship to cognitive structuring

Variable	Cognitive structuring type comparing	Point values	Point difference	p
$M^{ŠMF}$	HPNS-LAACS vs LPNS-LAACS	49,93-57,29	7,36	0,024
	HPNS-LAACS vs LPNS-HAACS	49,93-60,13	10,20	0,004
	HPNS-LAACS vs HPNS-HAACS	49,93-57,93	8,00	0,027
$F^{ŠMF}$	HPNS-LAACS vs LPNS-HAACS	65,46-58,19	7,27	0,049
M^{PAQ}	HPNS-LAACS vs HPNS-HAACS	16,71-20,32	3,61	0,009
	HPNS-LAACS vs LPNS-HAACS	16,71-20,68	3,97	0,003
	HPNS-HAACS vs LPNS-LAACS	20,32-17,43	2,89	0,027
	LPNS-HAACS vs LPNS-LAACS	20,68-17,43	3,25	0,008
F^{PAQ}	Nonsignificant differences	-	-	-

PNS= personal need for structure, AACS= ability to achieve cognitive structure, H= high, L= low, M= masculinity, F= femininity, SMF = The Scale of Masculinity and Femininity, PAQ = Personal Attributes Questionnaire

On the base of results shown in Table 2 we can state, there is a relation of masculinity with a high ability to achieve cognitive structure and femininity with a high need of cognitive structure. If the masculinity is in relation to achieve the cognitive structure which determines the experience of certainty and femininity in relation to the need cognitive structure which determines the experience of uncertainty, we can assume the influence of masculinity and femininity to experience uncertainty, or certainty.

For this purpose we have the Table 3. It is clear in it that masculine participants always scored higher in scale of certainty and feminine participants always scored higher in scales of uncertainty (except N1 while using SMF). We have found out statistically significant differences in pathological uncertainty dimensions N3 (PAQ) and increased uncertainty N2 (SMF) for the benefit of feminine participants and in abnormal certainty I3 dimension (PAQ and SMF) for the benefit of masculine participants.

We could characterize the masculinity by the ability to achieve cognitive structure. This fact might be an indication showing the predisposition of a masculine type to cope with uncertainty actively, because ability to achieve cognitive structure is a factor reducing uncertainty.

Table 3: Gender differences in dimensions of uncertainty – certainty

		PAQ				SMF			
	Gender	N	AM	U	p	N	AM	U	p
U1	M	17	25,71	1,703	0,088	24	30,29	1,135	0,256
	F	15	29,40			25	29,20		
U2	M	17	6,12	0,228	0,820	24	5,50	2,604	0,009
	F	15	6,53			25	8,08		
U3	M	17	0,59	2,191	0,028	24	0,79	0,919	0,358
	F	15	1,13			25	1,04		
C1	M	17	13,82	0,152	0,879	24	14,42	0,825	0,410
	F	15	13,60			25	13,72		
C3	M	17	2,76	2,955	0,003	24	2,21	2,064	0,039
	F	15	1,13			25	1,44		

U1 = normal uncertainty, U2 = increased uncertainty, U3 = pathologic uncertainty, C1 = normal certainty, C3 = abnormal certainty; M = masculinity, F = femininity

On the other hand, we could characterize femininity by need for cognitive structure. High need for cognitive structure in case it is not saturated with a high ability to achieve cognitive structure, represents a predisposition of inadequate sensing of uncertainty, or inability to reduce the uncertainty. For feminine person is necessary from the aspect of uncertainty experience how his/her ability to achieve cognitive structure is developed.

We allege that we can support all hypothesizes we designated. But we do not forget that the next research will have to be realised to confirm the results obtained by this research sample.

5 Conclusions

In the context of increasing gender sensitivity in the educational process as an indicator of humanistic education we suggest:

- To socialize a person in the direction of androgyny, which we consider a balanced personality construct integrating masculinity and femininity.
- In the process of education to strengthen children's ability to make decisions, choose between possible routes, to create their own algorithms and heuristics.
- To strengthen "instrumentality" in order to reduce uncertainty in the ability to create a cognitive structure.
- To exploit the possibilities of problem teaching and learning at the expense of giving tasks, in which it is possible and necessary to obtain a solution using a single, pre-specified algorithm.

We could recommend an ambition for complex development of the personality for pedagogical and psychological practice in terms of integration of psychological androgyny, thus blending, mixing, or situational use of masculine and feminine gender roles (as highlights for instance Stake (1997)). We believe, like Jung, that every man has his feminine soul (anima) and every woman has her male soul (animus), and they necessarily complement each other. As Szondi says: "God is not a man and is not a woman either. God is a perfect hermaphroditical being" (Szondi, 2009, p. 17). He means that every person, man and woman, tries for perfection of androgynous beings.

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Primary Paper Section: A

Secondary Paper Section: AM, AN

ENFORCEMENT OF ENVIRONMENTAL ASPECTS OF SUSTAINABLE DEVELOPMENT IN LAND-USE PLANNING

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This paper has been developed, written and produced within the project ´Prosazování environmentálních aspektů udržitelného rozvoje (MUNI/A/1045/2009)´

Abstract: Currently, the concept of sustainable development is often used. However, its sense is not seen properly in many cases. The term is used, *inter alia*, by the Building Code especially in connection with legislation on land-use planning. In order that the problems related to enforcement of environmental aspects of sustainable development in land-use planning in addition to their solutions may be outlined, it is essential to deal with basic terms, sources and lack of their application.

Keywords: sustainable development, protection of the environment, land-use planning.

1 Introduction

The issue of promoting sustainable development is very wide. Therefore this paper is focused only on certain aspects and areas. However, it is necessary to deal with the interpretation of the concept of sustainable development which is not always clear although it is a frequently used phrase. The focusing on the environmental pillar of sustainable development and land-use planning relates to current problems (in particular changes in the use of certain land). The current situation is not ideal, which often leads to negative phenomena in this area. It could be improved; a discussion of the issue and general public's concerns are needed.

2 Sustainable development

2.1 The concept and its history

Calls for the need to change the development of civilization began to appear at the end of 60s of the 20th century especially in the context of the United Nations. The emphasis on a harmony of economic development and environmental protection was put in the **Stockholm Declaration of the UN Conference on Environment** in 1972. Article 13 of the Declaration contains a recommendation for an integrated and coordinated approach to development plans.

Gradually, the opinion that economic growth should be stopped has been overcome. Hence, the concept of sustainable development has been evolved in the **Report of the World Commission on Environment and Development** published in 1987 (Our Common Future). It attempted to reconcile requirements of an effective protection of the environment, nature, and natural resources with the economic development.

The **United Nations Conference on Environment and Development** in Rio de Janeiro (1992) adopted Agenda 21 which is considered a ´broad definition´ of sustainable development. Moreover, the Declaration containing a concise statement of what the term ´sustainable development´ provides was adopted at this conference.

The meaning of sustainable development is understood subjectively. It varies in different areas as belonging to the category of post-material values. Land-use policy is a crucial factor in this respect.[1]

The concept of sustainable development was redefined at the **World Summit on Sustainable Development** (WSSD) in Johannesburg in 2002. The content of the concept was reformulated so as to lead to a reassessment of the practical economic policy in addition to be politically and legally enforceable.[2]

The objective of sustainable development is stipulated even in the **Treaty establishing the European Community** (Article 2) as one of the roles of the Community. A support of *´harmonious, balanced and sustainable development of economic activities´* and *´a high level of protection and improvement of the environment´* is stated in the Treaty. A requirement to integrate environmental protection into a definition and implementation of Community policies, particularly with regard to promoting sustainable development, is set in Article 6 of the Treaty.[3]

Subsequently, the meaning ´permanently´ was abandoned with regard to a limited period during which a development may be affected. Czech legislation differs in this respect. **Environment Act No. 17/1992 Coll.** as amended defines sustainable development as *´the development that keeps a possibility of meeting basic needs of current and future generations without loss of biodiversity and natural ecosystem functions´* (§ 6). The term ´sustainable development´ is used mostly within the meaning of the purpose of Czech legislation, e. g. Environmental Impact Assessment Act No. 100/2001 Coll., as amended, or Act No. 183/2006 Coll. (Planning and Building Code), as amended. The provisions are mostly declarative without specific sanctions.

2.2 Pillars of sustainable development

Essentially, the definition of sustainable development is divided into three pillars which should be balanced: **environmental, economic and social**. The concept of sustainable development is often related to the environmental pillar as it relates to the need to regulate the consumption of natural resources. Objectives of economic and social pillars are rather unclear because short-term perspectives, dependent on the length of electoral term or on a term of economic investment return, are dominated in business or public administration. Social needs often change.

Economic development is often equated with economic growth which can be achieved not only by further exploitation of natural resources but also by technological and organizational innovation as well as by higher quality and productivity of human labour. The use of environmentally friendly technology in addition to less energy and raw material-intensive production are in accordance with requirements of sustainable development. Such economic growth (expressed as GDP growth) which does not increase the burden on the environment is considered sustainable under the concept of the Organisation for Economic Cooperation and Development (OECD).

Social sustainability refers to an effort of an adequate level of each individual including the length of life, the access to education, the purchasing power, etc.

From the perspective of economic and social development, environmental protection often sounds like an obstacle of economic or social development.[4]

Therefore it is necessary to bear in mind that one of the fundamental principles of sustainable development, which can be derived from international conventions, is the principle of **integration**. It means a need to take into account the environment in economic and other development plans, programs, and projects, and *vice versa* needs of economical and

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[4] Maier, K. et al.: *Územní plánování a udržitelný rozvoj*. Praha: ABF – nakladatelství ARCH, 2008. p. 7 - 11

social development should be taken into account when protecting the environment.[5]

2.3 The Czech Republic Sustainable Development Strategy

The Czech Republic Sustainable Development Strategy has been approved by Government Decree No. 1242 of 12 August 2004. The Strategy defines the main objectives and sub-objectives and instruments which should contribute to the balance among economic, environmental and social pillars of sustainability, the maximum attainable quality of life of the present generation in addition to creation of prerequisites for the quality of life of future generations. The particular issues of development are:

- the economic pillar
- the environmental pillar
- the social pillar
- research, development, education
- European and international contexts
- governance.

The three pillars of sustainable development are coupled with other areas of cross-sectional nature. Their mutual relations and interactions are important. It is often difficult to evaluate a specific area without taking into account the influence of other areas.

Selected **indicators** reporting on the approaching or receding targets, comparing the situation in other states, or evaluating and analyzing trends are the basis of the Progress report on the Czech Republic Sustainable Development Strategy.[6]

In relation to the enforcement of environmental aspects in land-use planning it is necessary to consider not only the environmental pillar but also one of the indicators in the abovementioned issue of ´governance´. It is the ***´*corruption perception index*´***.

Corruption conduct is a negative global phenomenon which undermines the principles of basic values, affects confidence in the legitimacy of state institutions, etc. Czech democracy is not yet mature enough to overlook a fight against corruption. As far as the perception of corruption, the Czech Republic is among the worst countries in Europe; it is not improving significantly.[7] When combining this fact with e.g. a possibility of the change of land category in the land-use procedure (resulted from land planning instruments) with related savings when building the lucrative construction ´on green field´, it is obvious that it is the issue of two economically contradictory interests.

2.4 Environmental pillar

Within this pillar, the protection of the environment, nature, natural resources, and landscape in addition to environmental limits are subsumed. The strategic objectives are to ensure the quality of components of the environment in the territory of the Czech Republic, to increase the quality gradually, to create prerequisites for regeneration of the landscape and for minimizing risks to human health as well as regeneration of wildlife. Furthermore, preservation of natural resources, minimization of conflicts of interest between economic activities and environmental protection, and contribution to a solution to European and global environmental problems are among the objectives. When evaluating indicators, a failure in trying to halt a **biodiversity loss** is alarming.[8]

The overbuilding falls within the activities that adversely affect biodiversity. Economic or social interests are often favoured in this activity because the consequences of biodiversity loss are not fully understood. Moreover, the precautionary principle is often incorrectly interpreted[9]. The implementation of this principle is essential in an effort to halt biodiversity loss.[10] The principle is characterized by § 13 of Environment Act No. 17/1992 Coll. as amended: *´if a risk of serious or irreversible environmental damage is assumed in consideration of all circumstances, doubt on such damage may not be the reason for postponing preventive measures.´*

3 Land-use planning

3.1 Legal regulations in the Czech Republic

Legal regulations on land-use planning were substantially amended in the last few years in relation to the development of the society and views on land use.

The Planning and Building Code (**Building Act**) No. 183/2006 Coll. and Act No. 186/2006 Coll. (on some amendments to laws relating to adoption of the Building Act and the Expropriation Act) entered into force on 1 January 2007.

Act No. 183/2006 Coll. has replaced Act No. 50/1976 Coll. (Planning and Building Code) as amended.

To implement the Building Act, Decree No. 500/2006 Coll. on land-use planning analytical supporting documents, land-use planning documentation, and registration of land-use planning activities, or Decree No. 501/2006 Coll. on general requirements for land use (and other decrees) were issued.

Act No. 184/2006 Coll. on withdrawal or restriction of ownership rights to the land or building (Expropriation Act) should not be omitted.

3.2 Objectives, tasks, and instruments of land-use planning

Land-use planning means the activity organized by the State. Its objectives are set in § 18 of the Building Act (for example: creating conditions for construction and sustainable development in a territory, protection and development of natural, cultural and civilization values of a territory, determining conditions for efficient use of land, protection of unbuilt areas). To achieve these goals, Building Act provides special tasks for land-use planning in § 19, item 1 (such as identifying and assessing the state of a territory, establishing the concept of territorial development, reviewing and assessing needs for changes in the area).

Under the Building Act, sustainable development of a territory consists in a balanced relationship between prerequisites for the positive environment, economic development, and cohesion of population in a territory satisfying the needs of the present generations without jeopardizing the living conditions of the future generations.

The land-use planning applies both **conceptual** and **implementing instruments**. The first group consists of land-use planning supporting documents, the land-use development policy, and land-use planning documentation. The second one consists of land-use planning permit or approval and land-use measures. These instruments are mutually related, coherent, and implicated.[11]

According to the Building Act, land-use supporting planning documents consists of land-use analytical supporting documents and land-use studies. They serve as the basis for provision or change of the land-use development policy, land-use planning documents, and decisions in the area. Land-use planning documentation consists of land-use development principles, land-use plans and regulatory plans.

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[5] Sands, P.: *Principles of International Environmental Law.* 2nd ed. Cambridge: Cambridge University Press, 2003. p. 253

[6] *Situační zpráva ke Strategii udržitelného rozvoje ČR.* Praha: Ministerstvo životního prostředí, 2007. p. 9 - 10

[7] Ibidem, p. 135 - 139

[8] Ibidem, p. 9 - 11

[9] e.g. Klaus, V.: *Modrá, nikoli zelená planeta: co je ohroženo: klima nebo svoboda?* 2nd ed. Praha: Dokořán, 2009. p. 87 - 95

[10] *Situační zpráva ke Strategii udržitelného rozvoje ČR.* Praha: Ministerstvo životního prostředí, 2007. p. 77

[11] Damohorský, M. et al.: *Právo životního prostředí.* 2nd ed. Praha: C. H. Beck, 2007. p. 198

The Building Code regulates planning permits on location of buildings or facilities, changes of the use of lands, changes of buildings, changes in the effect of buildings on land use, divisions or consolidations of land, and protection zones. The special realization instrument is a territorial measure (either a building ban or territory sanitation).

Natural, cultural, and civilization values of an area and landscape as an essential element of the environment are protected and developed in the process of land-use planning in the public interest. The process should be focused on the **efficient use of built-up areas, protection of un-built areas in addition to rational demarcation of areas which may be built-up**.[12] Currently, it is a problem. The abovementioned construction of industrial and business complexes ´on green field´ can serve as the example. It is a rather common phenomenon. However, it could have been avoided in many cases despite the increased costs and certain complications.

3.3 Environmental protection in land-use planning

Both public and private interests should be balanced within planning activities. The interests relating to environmental protection result primarily from special legislation. In land-use planning, these interests are not in the first place but they should be consistent with economic and social interests (in accordance with the concept of sustainable development). However, if makers of land-use planning documentation failed to protect the environment, not only that they have not met legal requirements but also they could be exposed to a risk of complications during subsequent negotiations on the draft documents. It is essential to realise that law provides several **means to assert interests related to environmental protection**. This is possible either by environmental authorities, or in assessing impacts of the land-use development policy and territorial planning documentation within the Environmental Impact Assessment of these conceptions pursuant to Environmental Impact Assessment Act No. 100/2001 Coll. (taking into account the possible impact of these documents on the NATURA 2000 area). Last but not least, the public can participate in the process of discussing proposals related to the formation of the land-use development policy and planning documentation. Everyone has the right to become acquainted with the proposals of the abovementioned documents and make written comments on them. The public may be represented by its authorized representative who has the right to raise objections to the consistent public comment.[13] On the other hand, the Ministry of Environment is not a planning authority. The Ministry for Regional Development is the central administrative authority in matters of land-use planning. The Ministry of Defence exercises a competence in areas for military purposes. It may also play a role in promoting the environmental aspects of sustainable development in land-use planning.

The term ´**public interest**´ was interpreted rather widely before 1989. Even in theory, the indisputable public interest in the operation of certain activity was not differentiated from the public interest in the location of a certain installation or building whose existence must be assessed individually. In some cases, those above mentioned interests may coincide. An administrative authority decides whether a certain installation or building is in accordance with the anticipated public interest. The authority is entitled to assess the urgency of public interest. However, the issue of decision-making limits can be seen in this case.[14]

3.4 Importance of information for sustainable development and land-use planning

Education, training, and edification play a vital role to change patterns of behaviour, production, and consumption in an effort to minimize conflicts of interests between economic activities and environmental protection. This is impossible without an access to relevant information and support to voluntary business activities in the environmental field.[15]

Acquisition, transformation, transmission and the use of all sorts of information (in various fields and forms, at any level of decision-making) are the elements of sustainable development.[16]

The question is how information is used in the process of land-use planning or whether there is sufficient awareness and willingness to use them where the law permits. Almost everyone surely knows from his/her neighbourhood this case: all the available options against a controversial planned change in the area were not sufficiently used; after the change is irreversible, the wave of indignation lifts and the cause is sought. Reserves can be seen even in basic education and general enlightenment. Such a situation would not occur if every person considered the exercise of their rights naturally (also through other entities) even in the process to which they are not directly related (but which may affect the environment in which they live). Administrative bodies themselves cannot manage to promote the environmental aspects of sustainable development in land-use planning. However, they are not sometimes helpful to the public participation in this process.

4 Conclusions

The concept of sustainable development has a nearly forty-year history in international documents, treaties, and national legislation. During this time, its definition has been changed and developed depending on the development of the society and views on development opportunities in various fields. Generally, an opinion is accepted that sustainable development has three pillars (environmental, economic and social). The pillars should be mutually balanced. Although the awareness of the need to protect the environment in various human activities was the original impetus for the use of the term ´sustainable development´, the promotion of the environmental dimension of sustainable development is still more difficult than in the case of other development aspects. There are many causes in this matter. However, information and values play a significant role because they influence the choices of ways to practise human activities and a solution to the conflict of public and private interests. Land-use planning (governed especially by the Building Act) belongs to the most important activities in which the promotion of the idea of sustainable development is necessary. Land-use planning can have crucial and irreversible consequences. Hence, it is very important to apply the principle of integration consistently to involve all potential participants into this activity. It should not be hindered in practice. In this regard, reserves can be seen in attitudes of administrative bodies.

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[12] Pekárek, M. et al.: *Pozemkové právo.* Plzeň: Aleš Čeněk, 2010. p. 121
[13] Damohorský, M. et al.: *Právo životního prostředí.* 2nd ed. Praha: C. H. Beck, 2007. p. 203 -205
[14] Truneček, J.: *Věcná břemena s veřejnoprávním prvkem.* Praha: Leges, 2010. p. 50 - 52
[15] *Situační zpráva ke Strategii udržitelného rozvoje ČR.* Praha: Ministerstvo životního prostředí, 2007. p. 11
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Primary Paper Section: A

Secondary Paper Section: AG

THE INFLUENCE OF THE CASE-LAW ON THE HUMAN RIGHTS DEVELOPMENT

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Abstract: The contribution deals with the influence of the Case-Law on the human rights development in United States of America. The concept of The Living Constitution containing human rights and freedoms is reached through the extensive way of interpretation - judicial legislation and the meaning given to legal terms by judiciary. I will focus on some few important decisions of courts (mostly the U.S. Supreme Court) as the sources of law in the field of human rights, their background, their importance and the consequences on the next development.
This element of Anglo-American legal culture has slowly acquired its place more and more in European legal culture and in European law can be found in the decisions of The European Court of Human Rights as well as The European Court of Justice.

Keywords: Supreme Court, decision, rights, constitutional, equality, European law

1 The principle of judicial review

The current status of human rights and freedoms in the U.S. has undergone a long development which has been influenced by various factors. The case-law (mostly the U.S. Supreme Court decisions) has played very important, if not the most important, role in this process.

The importance of judicial law-making results from the differences of the Anglo-American legal system in which one of the basic principles is the principle of judicial review. Under this concept, "*we understand the right of judicial authorities to declare an act of legislature unconstitutional and as such as null and void*."[1] The concept of constitutionality in this case should be understood in its wider sense, not only as understanding of the U.S. Constitution as the basic law of the land but also as a range of principles (including the principle of respect for human rights and freedoms and the principle of judicial review), laws, customs and judicial decisions that complete content of the basic law of the land which do not necessarily have to be expressed in writing[2].

The paradox is that no article of the Constitution or another legislative act endows the courts with the power - control of constitutionality. It is based on the traditions of the Anglo-American legal system and the U.S. Supreme Court explicitly declared it. The U.S. Supreme Court, in its decision *Marbury* v. *Madison* (1803)[3] gave judicial bodies authority to exercise and control acts of the legislature that "*shifted the creation of law to courts, or rather judges*."[4] If the judges conclude that there is a conflict between the Constitution and the law that should be applicable in their decision-making activities the judges are required to prefer Constitution as guardians of constitutionality: "*The question, whether an act, repugnant to the constitution, can become the law of the land, is a question deeply interesting to the United States; but, happily, not of an intricacy proportioned to its interest. It seems only necessary to recognize certain principles, supposed to have been long and well established, to decide it. That the people have an original right to establish, for their future government, such principles as, in their opinion, shall most conduce to their own happiness, is the basis on which the whole American fabric has been erected. The exercise of this original right is a very great exertion; nor can it nor ought it to be frequently repeated. The principles, therefore, so established are deemed fundamental. And as the authority, from which they proceed, is supreme, and can seldom act, they are designed to be permanent*". The result of this approach is that "*the law repugnant to the Constitution is null and void.*" In the opinion Chief Justice John Marshall[5] also stated that *„It is emphatically the province and duty of the Judicial Department to say what the law is.*" The principle of judicial review and recognition of the Constitution as the supreme law of the land (repugnant provisions are considered as null and void), and where the courts serve as a means to enforce the constitutionally guaranteed rights and as a corrector of the rights which are repugnant to the Constitution was (and still is) very important for further development and creation of law in the U.S.

1.1 Situation before 1803

The principle of judicial review has its roots and was visible even before *Marbury* v. *Madison*. "*The power of judicial review had already been asserted in the states and had been implicit in a few decision of the federal courts before 1803. But it had not yet been explicitly asserted by the U.S. Supreme Court and its theoretical basis in the axioms of republican ideology had not yet been satisfactorily demonstrated by a court*."[6]

An example of such decision (in human rights field) is the *Quock Walker Case* (1783)[7] in which the Supreme Court of Massachusetts ruled that slavery is repugnant to the Constitution of Massachusetts. The court ruled that the rights and customs penalizing slavery are repugnant to the Constitution of Massachusetts declaring that "*all men are born free and equal, and have . . . the right of enjoying and defending their lives and liberties*".[8] Even though, slavery was hence not prohibited by the Constitution, because of the principle of judicial review, the decision was binding. In the words of Supreme Court of Massachusetts judge, William Cushing: „*slavery is…as effectively abolished as it can be by the granting of rights and privileges wholly incompatible and repugnant to its existence*."[9]

In theory, this principle was discussed and justified when drafting the Constitution. In Federalist No. 78, devoted to the judiciary, Hamilton stated: „*The interpretation of the laws is the proper and peculiar province of the courts. A constitution is, in fact, and must be regarded by the judges, as a fundamental law. It therefore belongs to them to ascertain its meaning, as well as the meaning of any particular act proceeding from the legislative body. If there should happen to be an irreconcilable variance between the two, that which has the superior obligation and validity ought, of course, to be preferred; or, in other words, the Constitution ought to be preferred to the statute, the intention of the people to the intention of their agents*."[10]

Human rights and freedoms in the U.S. are double enacted: on the state and the federal level. On one hand, sovereignty in the field of human rights belongs to states; on the other hand, the state law must not be repugnant to federal law. However, it is the task of courts to interpret these rights and liberties: "*Meaning that courts give to different phrases and concepts contained in the Constitution, had relevant meaning throughout the United States history*."[11] The interpretation given by the courts is not unchangeable. It reflects social changes, which represent

[1] COOKE, E. J. *Ústava Spojených štátov amerických*. Bratislava: Nadácia Občan a demokracia, 1999, p.28.
[2] COOKE, E. J. *Ústava Spojených štátov amerických*. Bratislava: Nadácia Občan a demokracia, 1999, p.34.
[3] MARBURY v. MADISON, 5 U.S. 137 (1803). Available online: <http://caselaw.lp.findlaw.com/scripts/getcase.pl?navby=case&court=us&vol=5&page=137 >.
[4] KRÁĽ, J. *Ľudské práva v Slovenskej republike*. [S.l.] : [s.n.], 2004, p. 22.
[5] John Marshall (1755 -1835), Chief Justice of U.S. Supreme Court in 1801-1835.
[6] WIECEK, W. M.*Liberty under Law*. Baltimore: John Hopkins University Press, 1990, p. 34.
[7] As Quock Walker Case is called series of 3 judicial cases, 2 civil cases: *Quock Walker* v. *Jennison, Jennison* v. *Caldwell* and one criminal case *Commonwealth* v. *Jennison*, in which the jury stated that Quock Walker is a free man.
[8] Constitution of Massachusetts, 1780. Available online: <http://www.mass.gov/courts/sjc/constitution-slavery-b.html>.
[9] Available online: <http://www.mass.gov/courts/sjc/constitution-slavery-a.html>.
[10] *The Federalist Papers*, The Federalist. No. 78, author Alexander Hamilton. Available online: <http://avalon.law.yale.edu/18th_century/fed78.asp>.
[11] COOKE, E. J. *Ústava Spojených štátov amerických*. Bratislava: Nadácia Občan a demokracia, 1999, p.33.

(sometimes contradictory from today's point of view) attitudes and opinions of that-time society. This can be seen in decisions of the U.S. Supreme Court that sometimes, in its later decision, it overturns its previous decision. One of the judges of the Supreme Court (Charles Evans Hughes in 1907) expressed this by words: *"We are under a Constitution, but the Constitution is what the judges say it is and the judiciary is the safeguard of our property and our liberty under the Constitution*".[12] Below, I will focus on some important U.S. Supreme Court decisions that influenced the development of human rights and freedoms.

2 The restrictive interpretation of freedom and equality in the 19th century

The Declaration of Independence as well as the U.S. Constitution had proclaimed that all men are created equal; that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. The Bill of Rights was very progressive and comprehensive catalog of rights and liberties at that time. But the question is: Who is the subject of these rights? The U.S. Constitution uses the concept of citizen. However, who exactly is included under the word citizen? Based on the above-explained principle of judicial review, it is the task for courts to interpret this concept. The U.S. Supreme Court in its decision *Dred Scott* v. *Sandford* (1857)[13] found that "*Negros*" do not include under the concept of citizen as meant by the Constitution and as such they can not be entitled to rights and privileges guaranteed by the Constitution. "*The question is simply this: Can a negro, whose ancestors were imported into this country, and sold as slaves, become a member of the political community formed and brought into existence by the Constitution of the United States, and as such become entitled to all the rights, and privileges, and immunities, guarantied by that instrument to the citizen?... We think they are not, and that they are not included, and were not intended to be included, under the word 'citizens' in the Constitution, and can therefore claim none of the rights and privileges which that instrument provides for and secures to citizens of the United States.*"

The decision induced turbulent reactions in already escalating situation between the Northern and Southern states. Therefore, after the Civil War the XIV. Amendment, claiming that *All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside* was ratified. This amendment also guaranteed the Equal Protection of Law and the protection of civil rights and liberties have been removed to the state law (under the supervision of federal law).

2.1 The "*separate but equal*" doctrine

As the result of the XIV. Amendment and subsequent circumstances the constitutional doctrine of "*separate but equal*" started to be applied. Already in 1850 the Supreme Court of Massachusetts ruled that racial segregation in public schools was in accordance with the U.S. Constitution. It was so decided in the case of *Roberts* v. *City of Boston*.[14] Benjamin Roberts sued the City of Boston because his 5-year old daughter could not attend a local school near her home since she was black. The Supreme Court of Massachusetts refused his argument when it ruled that if blacks do have the right of access to education equivalent to that provided to whites, the constitutional guarantee of equality was respected.[15]

The Justice of the Supreme Court of Massachusetts, Lemuel Shaw, maintained: „*Racial prejudice is not created by law, and probably cannot be changed by law.*" The Supreme Court of Massachusetts herewith established the precedent that the state supreme courts in the South quickly adopted.

To protect and safeguard the rights and freedoms guaranteed in the XIII. and the XIV. Amendment Congress adopted the Civil Rights Act (1875), declaring *That all persons within the jurisdiction of the United States shall be entitled to the full and equal enjoyment of the accommodations, advantages, facilities, and privileges of inns, public conveyances on land or water, theaters, and other places of public amusement; subject only to the conditions and limitations established by law, and applicable alike to citizens of every race and color, regardless of any previous condition of servitude.*[16] The U.S. Supreme Court in a series of decisions together marked as *The Civil Rights Cases*[17] declared the above quoted provision unconstitutional. Justice Bradley rejected the XIV. Amendment as a basis for this legislation because it prohibited only s*tate action of a particular character*. [18]Civil rights secured by the Fourteenth Amendment could not be deprived by private actions and The Congress lacks power to reach such acts under the Amendment. Also, Bradley's reasoning on the Thirteenth Amendment was that private discrimination does not constitute either involuntary servitude or a badge of slavery.

In 1890 Louisiana passed *Separate Car Act*, stating that all railway companies (other than street-railroad companies) carrying passengers in that state were required to have separate but equal accommodations for white and colored persons, *by providing two or more passenger coaches for each passenger train, or by dividing the passenger coaches by a partition so as to secure separate accommodations.*[19] In 1892 H. Plessy was arrested, because he traveled in the part for whites, and refused to move into a part for the colored. The case was heard before the U.S. Supreme Court, which in his infamous *Plessy* v. *Ferguson* decision[20] declared that laws requiring separation of races are not repugnant to the Constitution, thereby legitimizing the doctrine of "*separate but equal*": *The object of the amendment was undoubtedly to enforce the absolute equality of the two races before the law, but, in the nature of things, it could not have been intended to abolish distinctions based upon color, or to enforce social, as distinguished from political, equality, or a commingling of the two races upon terms unsatisfactory to either. Laws permitting, and even requiring, their separation, in places where they are liable to be brought into contact, do not necessarily imply the inferiority of either race to the other, and have been generally, if not universally, recognized as within the competency of the state legislatures in the exercise of their police power.* The only dissenting[21] judge was J.M.Harlan: "*Our constitution is color-blind, and neither knows nor tolerates classes among citizens.*"

This decision of *Plessy* v. *Ferguson* was overturned just after 58 years. Wiecek also marked it as the "*leading segregation case of the Court's history*."[22] However, as Currie stated: "*In any event, Plessy was a reliable symbol of the times*."[23] In the field of

[12] Charles Evan Hughes, 1862-1948. "Charles Evans Hughes." BrainyQuote.com. Xplore Inc., 2011. Available online: <http://www.brainyquote.com/quotes/authors/c/charles_evans_hughes.html>.
[13] DRED SCOTT v. SANDFORD, 60 U.S. 393 (1856). Available online: <http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=US&vol=60&invol=393>.
[14] This case was also cited in later *Plessy* decision.
[15] Available online: <http://www.masshist.org/longroad/02education/roberts.htm>.

[16] *The Civil Rights Act* (1.3.1875). Available online: <http://chnm.gmu.edu/courses/122/recon/civilrightsact.html>.
[17] CIVIL RIGHTS CASES, 109 U.S. 3 (1883). As Civil rights cases is called a series of five cases, in which Afroamericans sued theatres, hotels and transit companies that had refused them admittance or excluded them from "*white only*" facilities.
[18] WIECEK, W. M.*Liberty under Law*. Baltimore: John Hopkins University Press, 1990, p. 100.
[19] Laws enacted in period 1875 – 1965 mandating *de iure* racial segregation later became known as „*jim crow laws*".
[20] PLESSY v. FERGUSON, 163 U.S. 537 (1896). Avaliable online: <http://caselaw.lp.findlaw.com/cgi-bin/getcase.pl?court=us&vol=163&invol=537>.
[21] U.S. Supreme Court (consisting of 9 judges) required majority of votes for its decison, but the dissenting judges are allowed to write their dissenting opinion.
[22] WIECEK, W. M. *Liberty under Law*. Baltimore: John Hopkins University Press, 1990, p. 104.
[23] CURRIE, D. P. *The Constitution in the Supreme Court.* The Second Century 1886-1986. London: The University of Chicago Press Ltd., 1990, p.40

public education the doctrine was confirmed by decision *Cumming* v. *Richmond County Board of Education* (1899)[24], in private schools by decision *Berea College* v. *Kentucky* (1908). The consequence of these decisions was that the equal protection clause was a dead letter, or, what amounted to the same thing, sunk into a hundred years′ sleep.[25]

3 Case–law in the 20th Century

The changes in the society leading to overturn the above mentioned decisions of the U.S. Supreme Court were slow and gradual. The definitive abolition of the "*separate but equal*" doctrine was Brown v. *Board of Education of Topeka* (1954)[26], one of the most significant decisions in American history. Signs of gradual change, however, occurred earlier: in 1938 the decision of the *State of Missouri ex rel. Gaines* v. *Canada*[27], in which the U.S. Supreme Court granted full equality in the dual education system: *The admissibility of laws separating the races in the enjoyment of privileges afforded by the State rests wholly upon the equality of the privileges which the laws give to the separated groups within the State.* Even in the decision *McLaurin* v. *Oklahoma State Regents Cases* (1950)[28] the court concluded that Appellant*, having been admitted to a state-supported graduate school, must receive the same treatment at the hands of the state as students of other races.*

3.1 *Brown* v. *Board of Education*

The facts of this case were similar to that in 1850 (*Roberts* v. *City of Boston*). Linda Brown had to attend school far from her home because she was black. When the father tried for his daughter to be allowed to attend closer school (for whites) he was denied. With the support of the National Association for the Advancement of Colored People (NAACP), chaired by Thurgood Marshall (who later became a judge of the U.S. Supreme Court) his case and 4 other similar cases were brought before the U.S. Supreme Court (together marked as *Brown* v. *Board of Education)*. The U.S. Supreme Court has unanimously stated: *We conclude that in the field of public education the doctrine of "separate but equal" has no place. Separate educational facilities are inherently unequal.*

What was the importance of this decision? "*Only a generation after it was handed down, Brown seems like an elemental force in American constitutional law, something so essential that the Constitution was unfinished before 1954. After Brown, American constitutional law could never be the same. Brown opened doors that could never be shut, not just for black Americans but for all who saw themselves the victims of inequality and discrimination."*[29] This decision was followed by many others[30] which together with the Civil Rights Acts (1957, 1960, 1964) eliminated discrimination based on race or sex. Subsequent decisions during the seventies and eighties of the 20th century came further applying the „*affirmative action*" policy.

3.2 As many judges, as many opinions: the death sentencing

In some cases, however, the U.S. Supreme Court does not provide a unanimous opinion on the matter, especially when such sensitive issue as death sentencing is at stake. As mentioned above, the sovereignty in the field of human rights belongs to states. This explains the fact that some states have abolished the death penalty, while others have not. In the case of *Furman* v. *Georgia* (1972)[31] Furman was claiming that the death penalty, sentenced by Georgia, is repugnant to the VIII. Amendment prohibiting cruel and unusual punishments. The U.S. Supreme Court (by a vote of 5 to 4) ruled in favor of Furman, nevertheless, the judges did not concur in their opinion and each one of the nine judges wrote his own opinion. Judge Powell, in his dissenting opinion: *The reasons for that judgment are stated in five separate opinions, expressing as many separate rationales. In my view, none of these opinions provide a constitutionally adequate foundation for the Court's decision. ... Punishments are cruel when they involve torture or a lingering death; but the punishment of death is not cruel, within the meaning of that word as used in the Constitution*. Judge Stewart in his concurring opinion: *I simply conclude that the Eighth and Fourteenth Amendments cannot tolerate the infliction of a sentence of death under legal systems that permit this unique penalty to be so wantonly and so freakishly imposed*. Thus, the U.S. Supreme Court effectively voided 40 death penalty statutes.[32] States had to rewrite their legislation and enact new statutes respecting views presented in Furman's case. Florida, Georgia, and Texas chose the way of limiting discretion by providing sentencing guidelines for the judge and the jury when deciding whether to impose death. The guidelines allowed for the introduction of aggravating and mitigating factors when determining sentencing. The U.S. Supreme Court accepted this approach in a series of cases known as *Gregg decision*[33] and held that the death penalty itself is constitutional under the Eighth Amendment: "*We hold that the death penalty is not a form of punishment that may never be imposed, regardless of the circumstances of the offense, regardless of the character of the offender, and regardless of the procedure followed in reaching the decision to impose it*. "In its later decisions the U.S. Supreme Court set certain conditions under which the courts are authorized to impose the death penalty (only for murder, only after consideration of all mitigating factors, only if all possibilities of appeal were exploited, etc.)[34]

4 The influence of Case-Law on the European Law

The typical feature of Anglo-American legal culture - judicial law- making - has slowly acquired its place also in the European legal culture. The European Court of Justice (as ex-Court of Justice of the European Communities) has consistently held that „*fundamental rights are an integral part of the general principles of law the observance of which the Court ensures, in accordance with constitutional traditions common to the Member States, and the international treaties on which the Member States have collaborated or of which they are signatories. The European Convention for the Protection of Human Rights and Fundamental Freedoms (hereinafter referred to as "the European Convention on Human Rights") is of particular significance in that regard* ".[35] Although the decisions of the European Court of Justice are not sources of positive law, through the way of formulating general principles and traditions

[24] CUMMING v. BOARD OF ED. OF RICHMOND COUNTY, 175 U.S. 528 (1899). The paradox is, that the author of this opinion was judge Harlan - the sole dissenting judge in *Plessy* decision.
[25] WIECEK, W. M. *Liberty under Law*. Baltimore and London: John Hopkins University Press, 1990, p. 105.
[26] BROWN v. BOARD OF EDUCATION OF TOPEKA, 347 U.S. 483 (1954). Available online: <http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=us&vol=347&invol=483>.
[27] STATE OF MISSOURI EX REL. GAINES v. CANADA, 305 U.S. 337 (1938). Available online: <http://caselaw.lp.findlaw.com/cgi-bin/getcase.pl?court=US&vol=305&invol=337>.
[28] McLAURIN v. OKLAHOMA STATE REGENTS, 339 U.S. 637 (1950). Available online http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=us&vol=339&invol=637.
[29] WIECEK, W. M. *Liberty under Law*. Baltimore and London: John Hopkins University Press, 1990, p. 158.
[30] *Regents of the University of California* v. *Bakke* (1978), *Griggs v. Duke Power Co.* (1971), *Runyon v. McCrary* (1976), *Bob Jones University v. United States* (1983), *Johnson v. Transportation Agency of Santa Clara, CA* (1987) and this policy continues.
[31] FURMAN v. GEORGIA, 408 U.S. 238 (1972). Available online: <http://caselaw.lp.findlaw.com/scripts/getcase.pl?navby=search&court=US&case=/us/408/238.html>.
[32] Available online: <http://www.deathpenaltyinfo.org/part-i-history-death-penalty#const.>.
[33] As Gregg decision are called 3 cases: *Gregg* v. *Georgia* (428 U.S. 153), *Jurek* v. *Texas* (428 U.S. 262), and *Proffitt* v. *Florida* (428 U.S. 242).
[34] COOKE, E. J. *Ústava Spojených štátov amerických*. Bratislava: Nadácia Občan a demokracia, 1999, p.111.
[35] 227/88 Hoechst AG v. Komisia. OUTLÁ, V.- HAMERNÍK, P.- BAMBAS, J. *Judikatura Evropského soudního dvora*. Plzeň: Vydavatelství a nakladatelství Aleš Čeněk, s.r.o., 2005, p. 277-278.

common to Member States (that include respecting fundamental rights and freedoms) have de facto become sources of law.[36]

An important step in formal recognition of human rights and freedoms in the EU was the adoption of the Charter of Fundamental Rights of The European Union (2000). After the Treaty of Lisbon came into force (1.12.2009), the Charter has become legally binding (as a part of primary law the Charter has the same legal value as the Treaty on founding EU). The Preamble of the Charter explicitly affirmed the rightscase–law that had arisen from case-law: *This Charter reaffirms, with due regard for the powers and tasks of the Community and the Union and the principle of subsidiarity, the rights as they result, in particular, from the constitutional traditions and international obligations common to the Member States, the Treaty on European Union, the Community Treaties, the European Convention for the Protection of Human Rights and Fundamental Freedoms, the Social Charters adopted by the Community and by the Council of Europe and the case-law of the Court of Justice of the European Communities and of the European Court of Human Rights.*

European Union under the Treaty of Lisbon also acceded to the The European Convention for the Protection of Human Rights and Fundamental Freedoms and committed itself to fully respect it. Because of this, the question about the relationship between the case-law of European Court of Human Rights and European law arose: Is the judicature of European Court of Human Rights binding for the European Law? "*If case-law of the European Court of Human Rights falls within the sphere of Community law and is as such "tucked" into the law of the European Court of Justice, it becomes part of Community law. Its effects in the legal systems of the Member States then enter new dimensions, the case law acquires the properties of Community law, such as supremacy and direct effect. The above described differences in the reception of the European Court of Human Rights case law in the legal systems of Member States negate. Everything becomes Community Law. Then it may happen that some case-law of the European Court of Human Rights, that does not undergo a reception by the European Court of Justice will continue to be accepted only to the extent that national law allows them. In contrast, „communitarized" case-law of the European Court of Human Rights will be (through the decisions of the European Court of Justice) directly effective and preferably applicable before the Member State law*."[37] Such an approach would mean that *„the European Court of Justice may, but do not have to create such an "union case-law", otherwise sequence, if the European Court of Justice identifies with the decision of the European Court of Human Rights, then the law of the European Court of Human Rights perspectively becomes directly effective and takes precendency over Member State law*."[38] Such an approach can give a very strong position to the European Court of Justice and the case law - direct effect and supremacy over the laws of the Member State legislature. The further practice of European Court of Justice will figure out how to deal with these issues.

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Primary Paper Section: A

Secondary Paper Section: AB, AG

[36] Based on article 220 of Treaty Establishing European Community, Court of Justice of the European Communities not only interpretes the law, but also formulates legal rules that implicit in European laws.
[37] Kühn, Z. - Bobek, M.- Polcák, R. *Judikatura a právní argumentace: Teoretické a praktické aspekty práce s judikatúrou*. Auditorium: Praha 2006, p. 78 etc. (herein reffered concept of „community law" is need to be meant as „ " after Lisbon treaty entered into force).
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QUESTIONABLE DEVELOPMENT OF REGULATION OF RENEWABLE ENERGY SOURCES IN THE EUROPEAN UNION

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This article was financially supported by Grant Project No. 374411 called the Renewable Energy Sources and their Legal Regulation by the Grant Agency of Charles University in Prague.

Abstract: This article focuses on the development and current situation of renewable energy sources in the European Union in a sphere of Energy law. Energy is a key sector in the European Community which becomes increasingly integrated both politically and economically. Renewable energy sources have nowadays a great importance and big volume of legislation highly affects member states of the European Union. Article concerns the development of Renewable Energy policy in European Union and stress importance of many strategic documents which laid down the foundation of European Energy law legislation. Article also deals with directive 2001/77/EC and directive 2009/28/EC. Both directives establish a common framework for the use of energy from renewable energy sources primarily in order to limit greenhouse gas emissions and to promote cleaner transport.

Keywords: Renewable Energy; Energy Law; Energy Policy

1 Introduction

Renewable energy sources have for almost several years presented a very topical issue and they are one of the leading impulses for changes in the field of energy industry in the European Union and also in the whole World. The growing volume of production from renewable sources just documents this fact. The European Union has for decades promoted the legislative measures that significantly influence energy policy and legislation of the Member States. The importance of a common energy policy has been increasing both with growing importance of environmental protection and with energy problems, which over time proved to be more and more acute. The EU was forced to develop a comprehensive and effective energy policy which functional legislative framework and broad coverage. The EU therefore created a high-quality institutional base, which deals with issues of energy policy. The EU is forced while creating the energy policy act very carefully and thoroughly in each area, because the views of Member States are often diametrically different in many fields and the finding a compromise is very difficult.

2 Historical development of legislation on renewable energy sources in the European Union

2.1 Strategic documents of the European Union in the field of renewable energy

In 1996, the European Commission published a Green Paper on renewable energy sources, which recommended an indicative target for renewable energy of 12% for 2010. This target was endorsed by the Council which in its resolution from 1997[1] stated, that it is a very ambitious target and that it could provide the useful guidance for increased effort at both EU and national levels. The European Parliament has suggested even the target of 15% renewable energy by 2010 and also challenged the Commission to come forward with concrete measures, including setting targets for individual Member States. In many sectors of the economy, the obligatory targets are used to ensure readability and stability for the industry, which allows planning and investing with a higher degree of certainty. Setting goals at the European level this stabilizing effect furthermore reinforce, as the EU policy has generally a longer time horizon and it avoids to destabilizing effects of short-term political changes in the individual Member States. The goals to be effective, they must be clearly defined, sufficiently specific and mandatory. Target 12% share for renewable energy was well intended policy objective, but it proved that for the development of the renewable energy sector it has been still inadequate[2]. The idea of setting indicative target for renewable energy of the EU members was also maintained in the European Commission White Paper from 1997[3]

However, no attempts to distribute the target between Member States were made and the indicative target was not given even the legal framework in the framework of legal enactment of the EU. The indicative target so became a political tool and stimulus for further work. The White Paper only stated that setting targets in individual Member States could encourage efforts to increase the use of available potential of renewable energy sources. Each Member State had to propose his own strategy based on evaluation its energy potential and mix its own strategy and within it propose its contribution set for 2010. The White Paper, however, has become the crucial basis for the proposal, which set indicative minimum targets for renewable energy electricity production for each Member. In the White Paper, a strategy and action plan on renewable energy were also announced, and in the same time, the need to develop all renewable energy, to create a stable policy frameworks and to improve planning regimes and access of renewable energy to the electricity grid was stressed. The European Community so recognized its need to promote renewable energy sources as a priority task, primarily because their use contributes to environmental protection and sustainable development. Possibility to create local employment, a positive impact on social cohesion and contribution to energy delivery security were the next impulses.[4] In 1998, the Council issued the Resolution on renewable energy sources, where renewable energy sources were set as a major priority of the European Communities, primarily because of security and diversification of energy supply.[5] European Parliament in its resolution of 30 March 2000 on electricity from renewable energy sources and the internal electricity market[6] stressed that to achieve results and objectives of the Community the obligatory and demanding targets in the field of renewable energy sources at the national level are essential. To promote new and renewable energy resources into the economies of the Member States, the permanent effort is needed. The European Commission has stressed that renewable energy can achieve a sufficient level of competition, if they receive support for a relatively long period of time. The EU has set itself an ambitious target of 12% of consumption by 2010 from renewable energy sources, and therefore it is particularly important to mobilize support for their development and use. Relying solely on hydroelectric power is not sufficient enough, and it is necessary to give space also to other renewable energy technologies, including hydrogen technology. The increasing use of electricity produced from renewable energy sources also represented an important part of the package of measures needed to comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change, and set of policies needed to meet other obligations.[7] European Union policy to support renewable energy sources stated a large number of non-obligatory goals, such as a target of 12% share renewable energy sources in 1997. Over time, however, it has proved that the achievement of these goals will be possible only if binding and enforceable standards will be set. The European Union therefore developed a series of legislation for specific sectors, such as the biofuels directive or the directive on electricity from renewable energy sources support, which introduced set of measures designed to achieve the objectives given. The support of renewable energy sources plays an important role in both areas. The EU cannot afford to

[1] Official Journal of the European Union, C 126, 1997, p. 6.

[2] Jones, CH., Ladefoged N., Van Steen H., Howes T. *EU Energy Law: Volume III - Book One, Renewable Energy Law and Policy in the European Union*, Claeys & Casteels Publishing BV, 2010, p. 115.

[3] European Commission, *Energy for the future: renewable sources of energy; White Paper for a Community Strategy and Action Plan* (COM (97)599), 1997.

[4] Bič, Josef. *Governance energetické politiky EU a potenciální pozice členských států*, Praha: Oeconomica, 2008, p. 18.

[5] Official Journal of the European Union C 198, 1998, p. 1.

[6] Official Journal of the European Union C 378, 2000, p. 89.

[7] Běhan P., *Nová právní úprava energetiky v právu ES*, Energetika, No. 9, 2006, p. 7.

fail in its elaborated and long-term policy of promoting renewable energy sources. From the development in this energy sector, it is clear that the EU is introducing more and more detailed, strict and obligatory measures in this area. Over time it became clear that the application of progressive measures relating to renewable energy at national level of member states has been sometimes very hard to enforce. That is why the EU must the most important and most needed measures establish in forms of directives and regulations which are binding and, in its specific way also enforceable.

2.2 Directive on the promotion of electricity from renewable energy sources in the EU internal market.

The above-mentioned policy instruments and initiatives led on September, 27th 2001 to the proposal and subsequent adoption of Directive 2001/77/EC on the promotion of electricity from renewable energy sources in the EU internal market ("Directive 2001/77/EC"). Even before the adoption of the directive, member states were engaged at the national level in various systems of support for renewable energy sources (such as green certificates, investment aid, tax exemptions or tax reductions). One of the objectives of this directive was to improve the functioning of these systems. It was mainly because in order to maintain investor's confidence and the development of renewable energy sources was thus reinforced. The directive also set indicative targets for renewable energy, simplified administrative procedures for new producers of electricity from these sources, set fair conditions for producers trying to connect to the grid and introduced mutually accepted guarantees of origin of electricity produced from these sources among member states. Original fifteen EU member states had an obligation to implement the Directive by October 2003. Ten new member states that joined the EU on May, 1th 2004 added to this obligation on the basis of the Treaties of Accession and accession-related acts.[8] The main goal of Directive 2001/77/EC is to increase the share of renewable energy sources on general production of electricity. Accordingly, the directive has set national indicative targets of energy consumption from these resources. The directive contains an obligation to ensure that the EU shall meet the global indicative target of 12% share of renewable energy in total primary energy consumption in 2010. The second key objective is to use 22.1% of electricity produced from renewable energy in overall EU electricity consumption in 2010. All member states so adopted national targets in the sense of the share of electricity produced from renewable energy sources. These objectives aside from small variations correspond to the reference values listed in Annex I of this directive. If the member states adopt measures necessary to achieve their national targets, the share of electricity from renewable energy sources for electricity production by 2010 in EU countries should be close to 22%, as expected by this directive.[9] There were just national targets for renewable energy in electricity consumption for individual member states which had to contribute to achieve this goal. While setting these targets by 2010, member states should ensure that these targets are compatible with all national commitments adopted in the framework of the commitments relating to climate protection by the EU under the Kyoto Protocol to the Framework Convention of the United Nations on climate change.[10]

3 New energy policy of the European Union on renewable energy for the 21th century

3.1 Determination of binding and enforceable targets for renewable energy

In the period after the adoption of Directive 2001/77/EC, the EU position has changed considerably in the energy sector. Even though measures resulting from the directive were groundbreaking somehow, they proved not be very adequate for the needs of European climate-energy policy for the 21st century. It has become obvious that the EU has become strongly dependent on imports of oil and natural gas from politically unstable areas and in conditions of still increasing prices.[11] In 2005, the European Council agreed at a meeting at Hampton Court, the EU is necessary to formulate a new European energy policy which should be grounded mainly on three pillars: namely on sustainability, security of energy supply (energy security) and competitiveness. Consequently, the Council in early 2006 appealed to the European Commission to take the leadership in the field of renewable energy sources, and asked it for an analysis on how to further promote the long-term renewable energy sources policy. The European Parliament even proposed to set target on 25% of renewable energy by 2020.[12] The European Commission on the basis of ideas mentioned above, established a work plan[13], which had to set itself a long-term vision for renewable energy in the EU. The work plan followed the lack of progress in the field of renewable energy sources in recent years. The European Commission understood main barriers in the complexity and decentralized applications using renewable energy sources, as well as in unclear and lengthy permitting procedures for planning and construction. Transparent and non discriminatory access to electricity networks was also not guaranteed. Progress in the EU proceeded quite unevenly and the national policy was often not proved as satisfactory and offering a stability for investors. The absence of legally binding targets for renewable energy on the EU level has proved as a overwhelming problem. A weak legal framework for the use of biofuels, and the lack of legislation for the heating and cooling have been also problematic. For the future development of renewable sources of energy it was required to remove inadequate barriers to the integration of these energy sources in the EU energy system and removing the persisting administrative barriers. Only in the electricity sector, based on Directive 2001/77/EC a modest progress was achieved and set targets undoubtedly promote the development of renewable energy sources. Differences in regimes for electricity, biofuels, heating and cooling so bring in different rates of growth in these sectors, which are not considered to be desirable. One of the key points of the draft work plan was proposal for mandatory and legally binding target of 20% share of renewable energy sources on the energy consumption in EU by 2020. The European Commission concluded that the overall target of 20% share of these resources on the EU energy composition is possible and necessary. The work plan also explains the need for surface implementing of renewable energy sources into energy policies in EU markets, and in this context proposes a new legislative framework for extending the use of these resources in the EU. This initiative should be linked with greater stability for businesses subjects, which could also lead to higher investment in this area. The European Commission then elaborated the Strategic goal for Europe's energy policy, which contained a set of measures that would contribute to achieve above mentioned objectives. It was indeed a very ambitious goal of European energy policy. While changing the long-term development of renewable energy, it should be come from existing legislative and policy instruments, especially from the Directive 2001/77/EC. The important task for the development of renewable energy sources should be finding a balance between increasing number of plants installment and a gradual reduction

[8] Official Journal of the European Union, L 236, 2003, p. 65.
[9] According to the latest developments in energy policies of member countries is predicted that by 2010 the member states reach a real share around 19%. The main reason can be seen that many member states did not adopt an active policy in line with EU objectives.
[10] Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfillment of commitments there under, available at: <http://eur-lex.europa.eu>

[11] European Parliament resolution on a European strategy for sustainable, competitive and secure energy − Green paper (P6_TA(2006)0603) of 14 December 2006, available at:
< http://www.europarl.europa.eu >
[12] Communication from the Commission to the Council, the European Parliament Renewable Energy Road Map Renewable energies in the 21st century: building a more sustainable future (COM/2006/0848) of 10 January 2007, available at:
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< http://eur-lex.europa.eu>

of costs on technologies using these energy sources.[14] The primary measure, which should lead to achieving above mentioned objectives, was to increase the share of renewable energy in the energy mix from original 8% to 20%. The important step towards an agreement on "the new directive" was meeting of the European Council in March 2007. The Council formally approved the so-called "20-20-20" proposal of the European Commission[15], including concrete and legally binding target for renewable energy sources for each Member State. The Council thus invited the Commission to submit its proposal for a new comprehensive directive on using renewable resources. The Council also agreed with the European Commission's proposal that 10% of all fuels in each Member State must come to the year 2020 from renewable energy sources. Thus, the proposal should include legally binding targets, determining the overall share of renewable energy and biofuels in the transport sector in all member states.

3.2 The climate-energy legislative package

In order to solve problems mentioned above, the European Commission proposed a package of measures concerning emissions trading, renewable energy sources, energy efficiency in the internal energy market and energy security, so called the Climate-energy package. In 2008 the European Commission proposed a package which represented an ambitious legislative project in the field of energy. The EU has worked on this package for several years, and the package represents the result of compromises across Member States. It consists of six legislative measures, which should primarily lead to reduction of greenhouse gases contributing to climate change and to reducing the dependence on fossil fuels. Besides to the objective directive which establishes targets for renewable energy sources in 2020, the climate-energy package includes also a regulation updating national emission targets for greenhouse gases reduction and a directive focused to improvement and expanding the EU Emissions Trading Scheme (EU ETS).[16] The final version of the legislation contained in the climate-energy package was approved by the Council of Ministers on the sixth April 2009 and so confirmed the wording which was agreed by member states in December 2008. The new EU energy policy unambiguously identified as one of priorities to begin as soon as possible expressively promote measures to protect the environment (mainly the reduction of greenhouse gases) and reduce the EU's dependence on energy imports from third countries. The new and revolutionary in its way measures in the field of renewable energy sources and energy efficiency just should contribute to this. The “20-20-20” initiative, which initially seemed to be unrealistic and too ambitious, happened to transform from strategy papers into binding and enforceable targets for EU member states. The climate-energy package introduced the major legislative measures, which greatly affect the energy national policies and influence their economies. Despite the reluctance of many states to accept these provisions, mainly because of fear from reducing the economic growth, it is necessary to realize that these measures are absolutely essential for energy policy development and for reducing negative impacts of energetics on the environment. The introduction of legislative measures of climate-energy package will represent considerable administrative costs, and many states will have great problems to meet with its standards. Even though that most likely not all the measures will be rigorously completed, the impact of the package on energy policies of the member states is crucial. The EU states have to respect its provisions and approximate to the targets set while implementation any new measures. One could expect that the more sophisticated EU legislative measures in the field of renewable energy sources will continue to follow. With the development of new technologies and exchange of experience between member states, the EU has had possibility for further enhancing of its legal regulation and for creating pressure for greater and more efficient use of renewable energy sources. Simultaneously, the EU policy in the field of resources becomes a stimulus for other nations of the world, which could be inspired by the EU legislation and in the same time more cooperate in solving energy and climate issues.[17]

3.3 New directive on the promotion of energy from renewable sources

Complex and complicated negotiations on the final form of the new directive on promoting renewable energy sources culminated in early 2009. In the course of legislative work the directive has been slightly modified from the original version which was introduced in the climate-energy package.[18] The Directive 2009/28/EC deals in details with facilities that are aimed to support the development of renewable energy sources. These include administrative procedures, planning, construction, information and training. Revaluation of policy development of renewable energy sources across member states in recent years showed that administrative obstacles and lack of transparent rules slow down the use and development of these resources. The unambiguous administrative procedures with fixed deadlines should be set. The rules should be adjusted so that to reflect the efficiency of equipments using renewable energy sources in terms of both cost and environment. The Directive 2009/28/EC is particular about developing awareness, education and the widest possible availability of certificates for installation equipment using renewable energy sources. It accents the cooperation between member states in issuing certifications and harmonization of principles based on European technology standards. In this respect, the directive comes from the directive of the European Parliament and Council 2005/36/EC from July, 6th 2005 on the recognition of professional qualifications, which will hereinafter cover matters that the new directive does not. Distribution of the binding target among the 27 EU member states in a form of an independent and legally binding minimum target for renewable energy sources became a key regulation of the whole directive. The way of allocation of renewable resources (20%) among member states has become the subject of complicated discussion across the EU Member States.[19] As the best system a method of so-called flat-rate increasing adjusted by GDP, which expresses the simple and fair increase for all EU states was chosen. In sectors of renewable energy sources both electricity (which has been already supported by Directive 2001/77/EC), but also heating, cooling and transport were included. Thus introduces a comprehensive tool for the legal regulation in this area, enabling a coherent and effective approach to solve problems and to save administrative costs. The development of renewable energy sources in the field of heating and cooling could be recently seen as stagnating and the legal framework governing these areas has still not been sufficient. The directive gives member states a free choice in selecting the extent to which they will invest into renewable energy sources.[20] The only exception represents transport sector, in which the share for renewable sources is at least 10%. The reason is not only a strong increase in emissions of greenhouse gases in this area but also reducing of dependence on oil and other fossil fuels, which is in correspondence with the current policy of energy supplies covering. The given target for the share of renewable energy sources in transport has been established for all member states equally to ensure compliance among them within the variety and availability of fuels. Although among the

[14] Use of renewable energy is still undoubtedly significantly more expensive than the use of carbon technology, but it is necessary to take into account heavy secondary costs associated with the fight against climate change.

[15] European initiative known as "20-20-20" means the EU target in 2020 reduced consumption energy use by 20%, reduce greenhouse gas emissions by 20% and increase renewable energy to 20% of total energy production in the EU compared to 1990.

[16] European Council, *Energy and climate change - Elements of the final compromise* (17215/08), 2008, available at: <http://www.consilium.europa.eu>

[17] Frass-Ehrfeld, C. *Renewable Energy Sources: A Chance to Combat Climate Change*, 2009, p. 315.

[18] On 5 June 2009 Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC was published in the Official Journal L 140, p. 16.

[19] Johnston, A.: *The Proposed New EU Renewables Directive: Interpretation, Problems and Prospects, European energy and environmental law review*, Kluwer Law International, No. 3. 2008, p. 126.

[20] Werring, L., Bertoldi, P., Bowie, R., Hodson, P., Lorentzen, J., Vaggen Malvik, H., *EU Energy Law: EU Environmental Law, Energy Efficiency and Renewable Energy Sources*, 2010, p. 116.

states there are large disparities in access to renewable energy sources, this provision could reinforce a trade between member states and a development of trans-European networks. The directive so gives member states a possibility in case they do not keep their national targets for 2020, the other countries can transfer their 'accounting' surpluses to them. The EU thus took the standpoint that mainly meeting the general target of 20% renewable energy in total energy consumption by 2020 is important[21]. As stated in article 4, paragraph 3, the each member state is obliged to publish and submit to the European Commission a document with preliminary estimates, in which primarily indicates the estimated surplus of renewable energy sources in comparison with estimated demand of them which should be covered from other sources than from domestic production by 2020 six months before the deadline for drawing up national action plan for renewable energy sources. This is therefore a certain own assessment of the potential of renewable energy sources in the territory of individual member states in the framework of their preparations for the issue of national action plans. It should be noted that these reports are by the nature political documents and thus they are not directly binding or enforceable. On the basis of reports submitted to the European Commission[22], most European countries suppose that the share of renewable energy sources in energy consumption total they will meet exactly according to allocated binding targets (e.g. the Czech Republic or France). Several countries, including Sweden, Denmark, Germany or Spain, announced that medium-term targets will be evidently exceeded and their offered their surplus to others. Some countries have nevertheless expressed doubts whether they can fulfill their promises (e.g. Belgium and the Netherlands).

Conclusion

The Directive 2009/28/EC has in a way meant a revolutionary step in promoting greater use of renewable energy sources. It has become a key part of a new energy policy that has been intensively prepared for several years in the EU. The Directive enforces a new policy to increasing the share of renewable energy sources in EU energy mix, which should become the leading initiative to enhance the EU autonomy in the field of energy and fighting against climate change. Setting mandatory national targets for individual member states should help provide certainty for investors as well as to encourage the continued development of technologies. Meeting the mandatory targets will require both the EU member states invest considerable funds in research and development in the field of technologies for energy from renewable energy sources. Member states are also expected that in promoting national measures they will cooperate with local and regional authorities, and disseminate information on how greater use of renewable energy sources is possible, which could help them to meet binding targets. After the inconsistent implementation and application of Directive 2001/28/EC, it is possible to use a complex system of administrative tools and notifications, which should ensure that the development of greater use of renewable energy sources in all member states will proceed exactly according to planned binding targets. Among these measures, in particular the National Action Plan stands out. It describes in the very detail national measures to promote renewable energy sources and is binding in individual member states. Even though the majority of member states is optimistic with regard to meeting its binding targets for renewable energy by 2020, the directive gives member states a possibility of utilizing a number of alternative tools that can help achieve this objective. These include primarily the possibility of joint projects between member states or support of mutual trade of electricity from renewable energy sources in the framework of internal energy market among member states. Renewable sources currently represent one of cornerstones of the ambitious energy policy in the European Union. Comprehensive and effective regulation on renewable energy sources, which is one of the fundamental objectives of energy policy the European Union, is in this respect a model and inspiration for the rest of the world. The support of renewable energy sources cannot be seen in isolation, but it is necessary to analyze also economic and social impacts, as well as their ambiguous impact on the environment. It is also necessary to take into account the different climatic and economic conditions of member states and related issues concerning integration trends and application of European legislation in this area.

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Primary Paper Section: A

Secondary Paper Section: AG

THE DEPENDENCE BETWEEN STOCK PRICE AND INTRINSIC VALUE OF A STOCK

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The paper is compiled in terms of Thematic direction 02 solution of Research plan FBE MENDELU in Brno MSM No. 6215648904/02 named "Main tendencies in the development of a competitive environment within the integration and globalization processes, and the adaption of business entities to the new conditions of the integrated market" realized by means of financial support of state resources through Ministry of Education, Youth and Sports.

Abstract: The paper focuses on analyze of the dependence between stock price and intrinsic value of a stock in the framework of fundamental analysis. First of all, fundamental analysis is characterized, focusing on the intrinsic value of a stock. Based on recent empirical researches, cited in the paper, important factors, which influence the dependence are presented. The dependence relates to the ratio between stock price and intrinsic value of a stock. This ratio is used to identify overvalued and undervalued stocks and to predict the expected yield on stocks in the future. Statistical analysis of stock prices and intrinsic values of stocks from selected capital market makes investors decision more easier. That is decision how to invest, what is the optimal way of investing.

Keywords: stock price, intrinsic value of a stock, fundamental analysis

1 Introduction

Investors invest in many types of securities in capital markets. Stocks are one of these types. To find reliable information about selected stocks, investors use different investment analyses, especially fundamental analysis or technical analysis. Investors also try to calculate the intrinsic value of a stock. Calculating intrinsic value, investors find undervalued and overvalued stocks. Investors should sell overvalued stock, because stock price will obviously fall in the future whereas he should buy undervalued stock.

2 Objectives and Methodology

The objective of this paper is to analyze dependence between stock price and intrinsic value of a stock in the framework of fundamental analysis. Data founded from many cited empirical researches are statistically evaluated. Descriptive and analytical methods are used in this paper. Descriptive method is used for explaining of important terms related to fundamental analysis, concretely to estimation the intrinsic value of a stock. The results from empirical researches are analyzed by analytical method.

3 Results

3.1 Fundamental Analysis

This type of investment analysis is very often used by investors, because it provides a long-term and medium-term forecast of stock price trend. Fundamental analysis is able to identify the factors which influence stock price. Many subjects need to know this kind of information. Not only investors, but also stockholders, stockbrokers, bank staff, financial managers and others. Fundamental analysis also incorporates economic situation of issuer of a stock. The aims of fundamental analysis are to calculate intrinsic value of a stock and to make forecast of stock price trend. Long-term forecast is also known as projection, medium-term forecast is also known as cyclic forecast. Fundamental analysis is not able to provide the short-term forecast, because stock price changes during are caused by other factors, which are described in the framework of mob psychology. Fundamental analysis does not incorporate that factors at all. Creating medium-term forecast it is insisted on demand fixing, because level of business activity is determined rather changes of receipts and expenditures than changes of capacity. The probability of major changes of capacity is too low. Economic changes are mostly caused by changes of receipts, expenditures and profits, changes of fiscal and monetary policy. Medium-term forecast are caused by economic forces acting inside economic structure. Creating long-term forecast it is insisted on demand fixing. While medium-term forecast is valid for one or two years, the validity of long-term forecast is not so exact limited.

3.2 Intrinsic Value of a Stock

One of the premises of fundamental analysis is, that securities, which actual price does not equal to its intrinsic value, really exist and they are listed in some stock exchange. Proponents of fundamental analysis believe that certain intrinsic value can be calculated for every security. Intrinsic value of a stock can be calculated by methods of fundamental analysis. It means the „justified price" and it express the real value of a stock. Ideally stock should have this price. Stocks are overvalued while intrinsic value > price, whereas stocks are undervalued while intrinsic value < price. If intrinsic value equals to price, stocks are fairly valued. The estimating the intrinsic value of a stock belongs among basic aims of fundamental analysis.

Investors use different methods for estimating the intrinsic value of a stock. The choice depends on known parameters, which are needed for certain method. Often used methods are: dividend discount model, profit model, combination of dividend discount and profit model and historical model. There are different types of dividend discount model signed as Gordon models depending on decreasing, stagnation or increasing of dividends. The increase or decrease can be linear or nonlinear. Probabled increase rate of dividends can be estimated by means of historical data analysis, subjective estimation of financial analysts or financial indicators of companies. The rate depends on return of equity capital, indebtedness, margin of profit and generally on chosed dividend policy. Damodaran linear and loglinear model are used, too.

3.3 Empirical Researches Relating to Dependence Between Stock Price and Intrinsic Value of a Stock

Foerster and Sapp (2006) analyze the dependence between the actual values and estimated intrinsic values of the Standard & Poor´s Composite Index. They analyze data with one month period using a comprehensive database of U.S. economic and price-based factors during 1871-2005. The intrinsic value of a stock is estimated by dividend discount model, which is based on an estimated 30-year rolling equity premium and corresponding cost of equity combined with perfect foresight of dividends. They find, that stocks are undervalued, on average, by approximately 26 % over the entire sample. Prior to 1945, the stock were permanently undervalued and they displayed more bond-like characteristics ince. Since 1945, stocks were, on average, fairly valued but with long periods of undervaluation and overvaluation. Since 1945, the Federal Reserve System model also finds equities were undervalued, but its predictive ability decreases when one considers other factors. Across both periods economic and price-based factors can explain much of the levels and changes in "pricing errors" on the markets. Based on comparison of estimated cost of equity (using the Capital Asset Pricing Model) with implied measures from the actual price and dividend series they observe that many of the differences are related to economic conditions in the country. There are the means (and standard deviations in parentheses) for dividends, earnings, returns and valuation measures:

Table I: Summary Statistics for the Characteristics of the Standard & Poor´s Composite Index

	1871 - 1913	1914 – 1944	1945 – 2005
Change in dividends	0.0219 (0.1191)	0.0209 (0.1659)	0.0609 (0.0596)
Change in earnings	0.0255 (0.1659)	0.0648 (0.3284)	0.0871 (0.1811)
Dividend payout	0.7049 (0.1438)	0.7144 (0.2276)	0.5053 (0.0953)
Dividend yield	0.0501 (0.0115)	0.0579 (0.0155)	0.0364 (0.0140)
Capital gain	0.0293 (0.1561)	0.0454 (0.2667)	0.0894 (0.1557)

Total return	0.0793 (0.1493)	0.1033 (0.2558)	0.1258 (0.1547)
Price/earnings ratio	14.4119 (2.9430)	12.9423 (4.4077)	16.1108 (6.8435)

Source: Foerster and Sapp (2006)

Decomposing the levels (as opposed to the variances) of stock prices into their fundamental and non-fundamental elements in the context of a multivariate present value model co-integrating framework is the subject of research of Zhong, Darrat and Anderson (2003). They utilize the Gonzalo and Granger procedure to formally test for the statistical significance of the non-fundamental component. They also propose a new methodology to test Fama's contention that the present value model should be augmented by time-varying expected inflation to more adequately account for actual stock price behavior. Based on analyze of US post-WWII monthly data during 1947-1997 they confirm the inability of the present value model, even after augmentation by time-varying expected inflation, to adequately explain actual market behavior. The non-fundamental component of stock prices is significantly different from zero.

Similarly Johnson and Xie (2004) analyze the convergence of stock price to fundamental value. They advert to Frankel and Lee study published in 1998, which show that fundamental value-to-price ratios (V/P ratio) predict future stock returns for up to three years. This empirical regularity is known as a V/P effect and it is consistent with the notion that extreme V/P ratio identify stocks that are initially mispriced but whose prices converge to fundamental value estimates over time. Johnson and Xie find whether price convergence explains the V/P effect and how price discovery occurs. The results of their research work imply that only 23 % of the top and bottom V/P quintile stocks exhibit price convergence over the ensuing 36 months. Price convergent subsample returns are disproportionately concentrated around future quarterly earnings announcements. The collective evidence supports mispricing, rather than risk, as an explanation for the V/P effect. The descriptive statistics for the sample utilised in testing are presented in Table II.

Table II: The descriptive statistics for the sample

	Mean	Standard deviation	First quartile	Median	Third quartile	Observations
V/P	0.83	0.79	0.54	0.73	0.98	25.662
BM	0.69	1.29	0.34	0.55	0.81	25.662
K	0.27	0.29	0.00	0.21	0.43	25.662
R	0.12	0.03	0.10	0.12	0.14	25.662
ROE	0.10	0.15	0.07	0.12	0.17	25.662
ROA	0.04	0.08	0.01	0.04	0.08	25.662
B	13.40	273.34	3.64	6.95	12.29	25.662
P	21.53	437.00	7.38	13.50	22.17	25.662
MV	2.204	9.276	135	423	1.345	25.662

Source: Johnson and Xie (2004)

There are used variables:

V/P … the ratio of estimated fundamental value (V) to share price (P)

BM … the year-end per share book value of equity, divided by closing share price in June of the following year

K … the historical dividend payout ratio (if income is positive) or the rate of historical dividends divided by six percent of total assets

R … the estimated cost of equity capital, calculated as the one-month T-bill rate plus a Fama and French industry-specific three-factor risk premium

ROE … return on equity, calculated as the ratio of income before extraordinary items divided by year-end equity book value

ROA … return on total assets, calculated as income before extraordinary items divided by year-end asset book value

B … year-end equity book value per share

P … the June closing share price

MV … the market value of equity as of the end of June

Capozza and Israelsen (2009) find how quickly do equity prices converge to intrinsic value. They focuse on markets where information costs, transactions costs and the economic impact of information can vary widely. They find that 15-30 % of the difference between the stock price and the estimated intrinsic value is removed in a year. Moreover, levels of predictability vary with firm characteristics like leverage, size and number of analysts. While momentum is stronger for larger firms with more analysts, reversion to the intrinsic value is greater for smaller firms with more analysts. They reach that the value of information is the net payoff from trading on the information. Information is less costly to acquire for some securities, especially large firms and widely followed firms. Net revenue from information is higher for more levered firms and more liquid firms. Private information is more valuable than public information so that corporate insiders have an information advantage. Barriers to entry increase the value of information, e.g. for market makers and specialists. The descriptive statistics for the sample utilised in testing are presented in Table III.

Table III: The descriptive statistics for the sample

Variable	Mean	Standard deviation	Minimum	Maximum
Monthly Log Return for Price	0.00	0.14	-0.52	0.43
Monthly Log Return for Intrinsic Value	0.00	0.26	-1.35	1.14
Percent to Target	0.20	0.72	-1.27	3.23
Liquidity	12.63	2.34	7.30	17.84
Size	12.99	1.84	8.98	20.18
Leverage	0.54	0.27	0.00	1.26
Analysts	1.58	1.09	0.00	4.25

Source: Capozza and Israelsen (2009)

Stock price changes are caused by different reasons. Expected growth rise, expected risk rise and fundamental changes belong – in accordance with Curtis (2010) – among these reasons, too. He focuses on stock price volatility. Creating specific method for estimating the intrinsic value of a stock, he find the dependence between stock price and intrinsic value of a stock. This fundamental analysis based method incorporates expected growth and expected risk. Using Phillips-Peron test and Johansen test he find that price and fundamental values are cointegrated during 1979-1993, but during 1994-2008 there is no evidence of cointegration. Curtis also finds whether recent price movements include significantly larger speculative components than observed historically. Results of his research provide evidence of a significant change in the long-run association between stock price and accounting fundamentals and imply that large speculative components in price cannot be ruled out in recent periods.

The stocks of two companies have usually different elasticity. Their prices move up and down differently. Vaknin (2010) tries to find the reason of it. He describe fundamental and technical models. Fundamental models rely on the company´s performance and assets. The value of a stock means, according to him, the sum of the income that a reasonable investor would expect to get in the future, discounted at the appropriate rate. He uses Capital Asset Pricing Model (CAPM) and Dividend Discount Model (DDM) to identify the risk.

Relation between actual stock price and actually calculated intrinsic value stock enable to give signal to investors to buy or to sell some stock. Stock can be overvaluated, fairly valuated or undervaluated. These opinions about stocks are related to stock recommendations and earnings forecasts, which reflect future fundamentals. Future fundamentals determine value, so that forecasts and recommendations should be related. Bradshaw (2000) tests for evidence of it. Using residual income valuation model, he generates intrinsic value estimates for a

comprehensive range of plausible calibrations of the model parameters. Based on achieved results, it is clear, that analysts' stock recommendations are generally unrelated to the deviation of intrinsic value estimates from trading prices. The evidence suggests that analysts incorporate their earnings forecasts into their recommendations in a manner consistent with earnings-based heuristics rather than a discounted present value valuation model. The descriptive statistics for the sample utilised in testing are presented in Table IV.

Table IV: The descriptive statistics for the sample

Variable	Mean	Median	Standard deviation	Minimum	Maximum
REC	3.88	3.87	0.49	1.00	5.00
N_{REC}	13.62	11.00	9.69	1.00	56.00
V/P	0.67	0.59	0.48	0.00	10.00
R	0.11	0.11	0.03	0.04	0.18
MV	4079.34	851.53	11736.66	6.22	248255.26
B/M	0.46	0.41	0.28	0.01	3.75
DP	0.19	0.12	0.22	0.00	1.00

Source: Bradshaw (2000)

There are used variables:

REC … consensus (mean) analyst recommendation, ranging between 1 to 5 , with 1=Strong Sell, 2=Sell, 3=Hold, 4=Buy, and 5=Strong Buy

N_{REC} … number of analysts' recommendations included in the consensus recommendation

V/P … intrinsic value estimate V divided by PRICE, where PRICE is the share price on the date the consensus recommendation and forecasts are calculated by First Call. V/P is calculated as described in the text

R … industry cost of capital estimates based on Fama and French three-factor estimates of the industry -specific equity risk premia and the risk-free ra te in effect for the month prior to the release of the forecasts and recommendations. The risk-free rate is proxied by the 30-day treasury bond yield

MV … market value as of the beginning of the fiscal year being forecasted

B/M … book-to-market ratio calculated as of the beginning of the fiscal year being forecasted

DP … dividend payout ratio as of the most recently completed fiscal year

4 Conclusion

Many researchers try to explain the dependence between stock price and intrinsic value of a stock in detail. Their research is based on theoretical formulation of both of terms. Realizing empirical analyses, researchers try to verify theoretical relation between these terms. Results of the empirical analyses depend especially on used samples of stocks, time period and method. Mostly they do not incorporate different types of stocks – common stocks, preferred stocks, staff stocks etc. Research focused on relation between theoretical price and market price is important not only for academic workers and investors. Results are needed for different participants on financial market. Describing fundamental analysis and intrinsic value of a stock, some empirical researches were cited. These researches related to dependence between stock price and intrinsic value of a stock. Results of statistical analyses presented in the paper makes investors decision how to invest more easier.

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Primary Paper Section: A

Secondary Paper Section: H

BACKGROUND FOR ASSESSING THE OBJECTIVES OF CULTURAL POLICY AT REGIONAL LEVEL

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This article builds on the research project VEGA no. 1/0291/08: Analysis of the functioning of environmental policy instruments in the context of socio-economic regional disparities in Slovakia.

Abstract: The aim of the article is a theoretical definition of the background for the evaluation of cultural policy at the regional level. Based on the analysis of scientific resources cultural policy and recommended objectives of cultural policy have been theoretically defined. Subsequently indicators to evaluate the objectives of cultural policy have been set. These indicators were the basis for analysis of selected concepts of cultural development of higher territorial units in Slovakia.

Keywords: cultural policy, objectives of cultural policy, concept of cultural development.

1 Introduction

The aim of the article is a theoretical definition of the background for the evaluation of cultural policy at the regional level. Cultural policy is a purposeful action on the conditions of the culture and through these conditions on the culture. It is perceived as a continuous care of the state of cultural development of the country and population. The main aim of cultural policy is to set objectives, create structures and secure sufficient resources to create a favorable environment for human fulfilment. States are recommended to take five basic policy objectives. These objectives were the basis for analysis of selected concepts of cultural development of higher territorial units in Slovakia.

Material, needed for processing this article, was obtained in secondary research, where we analysed existing and available literary sources, which deal with these issues and the concepts of cultural development of higher territorial units. During processing the article we apply methods of analysis, synthesis, abstraction, induction and deduction. This article builds on the research project VEGA no. 1/0291/08: Analysis of the functioning of environmental policy instruments in the context of socio-economic regional disparities in Slovakia.

2 Cultural policy and the objectives of cultural policy

According to The Proposal Concept of Development of Local and Regional Culture (Ministry of Culture and Tourism, 2007) in the European space cultural policy is understood as a state created environment in which the processes of creation, preservation and dissemination of cultural values are carrying out. The main tools used by the state are:

- legislative measures aiming at developing a culture,
- public financing of culture and arrangements for multi-resource financing of culture,
- ensure the availability of informations about culture, how they are spread, as well as citizens' access to the culture.

In Slovakia cultural policy is defined in The draft national strategy for cultural policy (Ministry of Culture and Tourism, 2002) and it is a purposeful action on the conditions of the culture and through these conditions on the culture. It is a set of policies for each sub-cultures. Cultural policy is perceived as a continuous care of the state of cultural development of the country and population (Slovakia - Cultural Profile, 2010). It is implemented at international, national, regional and local level.

Thorsby (2001, p. 144) in his publication, indicated as a fundamental objective of cultural policy to set objectives, create structures and secure sufficient resources to create a favorable environment for human fulfillment. Throsby recommends that states adopt five policy objectives:

1. to make cultural policy one of the key components of development strategy,
2. to promote creativity an participation in cultural life,
3. to reinforce policy and practice to promote the cultural industries and to safeguard and enhance the cultural heritage,
4. to promote cultural and linguistic diversity in and for the information society,
5. to make more human and financial resources available for cultural development.

General government creates frameworks and conditions for the development of culture, provides a basic network of cultural institutions and cultural infrastructure in the area. It also supports other agencies participating in the cultural life of society, regions and settlements. At the regional level concepts of cultural development are developed, which are concerned with creating better conditions from public administration for developing culture, which should contribute to the overall improvement of conditions for the development of culture in the broadest sense. Concept of cultural development touches all areas of culture (educational activities, museum and gallery activities, drama activities, activities in the audiovisual sector, protection of monuments, library activities and other cultural activities). In the evaluation of cultural policies at the regional level, we just analyze the concepts of cultural development. The above-mentioned objectives are relevant to us and they became the basis for the analysis and theoretical basis for the evaluation of selected concepts for cultural development of higher territorial units.

3 Set indicators to evaluate implementation of the objectives of cultural policy

Following establishment of cultural policy objectives indicators to evaluate implementation of the objectives of cultural policy were set (table 1). These indicators serve for analysis of selected concepts of cultural development of higher territorial units in terms of meeting the objectives of cultural policy.

Table 1 Set indicators to evaluate implementation of the objectives of cultural policy

	Objective	Indicator
1	to promote creativity and participation in cultural life	organizations for support of the culture (centers of edification)
2	to reinforce policy and practice to promote the cultural industries and to safeguard and enhance the cultural heritage	number of cultural institutions
		planned implementation of CEMUZ and CEDVU
3	to promote cultural and linguistic diversity in and for the information society	number of international projects of cultural organizations
		contribution to the financing of minority cultures
		promotion and presentation of theatrical productions in minority languages
		library collections in minority languages
4	to make more human and financial resources available for cultural development	number of employees of cultural institutions
		financial resources for cultural services per capita (Sk per capita)

Source: Own proposal

We describe the various objectives as well as set indicators for the need of analysis in the next chapter:

First objective – to make cultural policy one of the key components of development strategy. This objective is regarded as fulfilled for all of higher territorial units, since they all have elaborated the concept of cultural development.

Second objective – to promote creativity and participation in cultural life. To achieve this objective it is important to promote participation in cultural life, which is not only the spread of consumption, but also to promote active participation to develop their own skills. Supporting the participation in the cultural life of society is connected with creating conditions for creative contribution to development of culture. Public interest in the field of culture is regarding to The concept of developing local and regional culture (2008) ensuring citizens' access to culture, by promoting cultural activities and cultural projects of organizations and individuals, supporting initiatives and engagement of citizens in the field of culture, the use of cultural infrastructure of the territory and ensuring its availability in the territory, effective and creative activity of cultural institutions and promoting freedom of artistic creation.

The activity of centers of edification is very important to support creativity and skills development of the population. Their mission is to promote and develop local cultural values and traditions, to promote interest and artistic activities, ensuring the leisure, cultural and educational activities of the population, find, protect, preserve and make avalaible folk traditions with an emphasis on traditional and folk culture, creatively develop and use them, enable people to fill their leisure time with cultural activities. Due to the important mission we have set the number of centers of edification as an indicator.

Third objective – to reinforce policy and practice to promote the cultural industries and to safeguard and enhance the cultural heritage. According to The Convention on the Protection and Promotion of the Diversity of Cultural Expressions (Ministry of Culture and Tourism, 2005) cultural industry refers to industries producing and distributing cultural goods and services when assessing the quality, use or purpose, embody or convey cultural expressions, irrespective of the commercial value they may have. O'Connor (2000) argues that cultural industries are those activities which deal primarily in symbolic goods – goods whose primary economic value is derived from their cultural value. This definition then includes what have been called the 'classical' cultural industries – broadcast media, film, publishing, recorded music, design, architecture, new media – and the 'traditional arts' – visual art, crafts, theatre, music theatre, concerts and performance, literature, museums and galleries. Cultural goods are distributed by the cultural infrastructure, which represents a particular cultural institutions (museums, galleries, theaters, libraries, etc.) providing a background for the realization of cultural activities. For the dissemination of cultural goods it is important the accessability of cultural infrastructure and therefore, we have set number of cultural institutions as an indicator for monitoring the implementation of this objective.

According to the Law of National council of Slovakia NR SR. 49/2002 Z.z. about the protection of monuments (2002) protection of cultural heritage is a summary of activities and measures to identify, research, registrate, conserve, restore, use and presentate cultural monuments and historic sites. One possibility is the development of digitization projects of movable cultural heritage in museum and gallery collections. In the field of museums and galleries, there are two basic database systems. Central registry of museum collections (CEMUZ) is a database of information about collections in museums of the Slovak Republic and Central registry of works of art (CEDVU) is a database of information about works of art in the collections of galleries and museums of the Slovak Republic. The objective of the digitization of collections is a preservetion and accessing of knowledge about museum collections as well as the preservation and accessing of visualization objects. The set indicator is planned implementation of CEMUZ and CEDVU.

Fourth objective – to promote cultural and linguistic diversity in and for the information society. Slovakia, like other European countries, is not and has never been ethnically homogeneous. Around 86% of citizens of Slovak nationality 1and 14% of national minorities and ethnic groups live in the territory of Slovak Republic. The rights to overall development are guaranteed to citizens belonging to eleven national minorities and ethnic groups. As the main key to peaceful coexistence of different cultures it is needed tolerance, intercultural understanding and cooperation. As indicators of this objective we set the number of international projects of cultural organizations and contribution to the financing of minority cultures.

According to The concept of care for the state language of the Slovak Republic (Ministry of Culture and Tourism, 2001) language policy is closely linked with ethnic and cultural policy. State has the right to modify the language and situations on their territory, thus guaranteeing the position of civil language to ensure effective execution of state administration and a single information flow, but also to confer rights on persons using the minority language. The objective in the area of the linguistic diversity should be to create a favorable background in which all languages can free express and develop. Indicators of this objective is the promotion and presentation of theatrical productions in minority languages and the library collections in minority languages.

Fifth objective – to make more human and financial resources available for cultural development. The existence of financial and human resources is also essential for cultural development. Human resources are the most valuable and are a driving force, an engine that gives the movement of material and financial resources. We set the number of employees of cultural institutions and financial resources for cultural services per capita as indicators of this objective.

4 Analyse of concepts of cultural development

Slovakia is administratively divided into eight higher territorial units (HTU). Concepts of cultural development of six higher territorial units – Trnava, Banská Bystrica, Bratislava, Košice, Nitra and Žilina were available after an initial analysis made on the websites of HTU. The concepts of HTU of Prešov and Trenčín are not accessible on websites. From six available concepts three have been excluded – the concept of HTU of Košice due to insufficient content for analysis and concepts of HTU of Bratislava and Žilina because of out of date. The concepts of cultural development of three selected higher territorial units – Banská Bystrica (BB HTU), Nitra (NI HTU) and Trnava (TT HTU) have been analyzed (table 2).

Table 2 Analyse of concepts of cultural development according to set indicators

Objective	Indicator	BB HTU	TT HTU	NI HTU
to promote creativity and participation in cultural life	organizations for support of the culture (centers of edification)	6	4	5
to reinforce policy and practice to promote the cultural industries and to safeguard and enhance the cultural heritage	number of cultural institutions	22	18	21
	planned implementation of CEMUZ and CEDVU	yes	yes	yes
to promote cultural and linguistic diversity in and for the information	number of international projects of cultural organizations	8	-	6
	contribution to the financing of minority cultures	-	26121 Sk	-

society	promotion and presentation of theatrical productions in minority languages	yes	yes	yes
	library collections in minority languages	yes	yes	yes
to make more human and financial resources available for cultural development	number of employees of cultural institutions	437	326	569
	financial resources for cultural services per capita (Sk per capita)	227	253	318

Source: Own working out

To fulfill the objective – to promote creativity and participation in cultural life, it is important to promote participation in cultural life and promote active participation to develop own abilities. The activity of centers of edification, which occurrence we observed in the analysis, is important to support creativity and skills development of inhabitants. The centers of edification operate in all three studied HTU. The highest number is located in HTU of Banská Bystrica. Network of these centers is sufficient due to their activity and territorial scope in the region.

The second follow-up objective is objective – to reinforce policy and practice to promote the cultural industries and to safeguard and enhance the cultural heritage. Cultural industries produce cultural goods and those are spread through cultural infrastructure, which represents a particular cultural institutions (museums, galleries, theaters, libraries, etc.) providing an background for the realization of cultural activities. Accessability of cultural infrastructure is very important for the dissemination of cultural goods and, therefore, we watched the number of cultural institutions under the local government as an indicator. Their number in each HTU is approximately the same, most cultural institutions are in HTU of Banská Bystrica – 22 cultural institutions. One way of protecting and strengthening cultural heritage is its digitalization. All HTU are planning implementation of a central registration of museum collections (CEMUZ) and Central Register of works of art (CEDVU).

For monitoring the objective – to promote cultural and linguistic diversity in and for the information society, we set more indicators. Slovakia is not a homogenous country and the key to peaceful coexistence of different cultures is a cross-cultural understanding and cooperation. As indicators of this objective we set the number of international projects of cultural organizations and contribution to the financing of minority cultures. International projects are an appropriate form of cooperation, as well as presentations and can significantly increase the international prestige of the region. In international projects is involved HTU of Banská Bystrica and HTU of Nitra, more projects are in HTU of Banská Bystrica. HTU of Trnava is not mentioning involvement in international projects. All three HTU are mentioning in their concepts of development of culture that they support minority cultures, in what the term minority culture means culture of those groups that require special attention and treatment as their social and cultural characteristics are different from the dominant group. The rate of contribution to the financing of minority cultures is mentioned only by HTU of Trnava and it is 26 121 Sk.

To create a favorable background, in which all languages can free express and develop, should be a priority in the field of linguistic diversity. Indicators of this objective is the promotion and presentation of theatrical productions in minority languages and the library collections in minority languages.. All observed HTU meet this goal. Regional libraries build and maintain library collections in minority languages. They are actively involved in cross-border cooperation, particularly with libraries in Hungary. Also a library collections in Czech language are rather extensive in all the regional libraries, which reflects the common historical development, as well as the general knowledge of Czech language in Slovakia. Theatres for decades successfully collaborate with several theaters in Czech Republic and Hungary, in the form of reciprocal hosting or regular attendance at theater festivals and shows. They expand their activity also through tours and performances.

To watch the last objective – to make more human and financial resources available for cultural development, two indicators have been set – the number of employees of cultural institutions and financial resources for cultural services per capita. Numerical values of these indicators can be found in all three concepts. The highest number of employees of cultural facilities has HTU of Nitra – 569 employees, the lowest number HTU of Trnava – 326 employees. Regarding the indicator resources for cultural services per capita, the highest amount is in HTU of Nitra – 318 Sk per capita. Since funding the implementation of various cultural activities are a fundamental prerequisite for the maintenance and development of cultural values in the region**,** one of the priorities must be to make the cultural development the utmost element of socio-economic development of the region.

All recommended objectives of cultural policy are represented in watched concepts of cultural development of selected HTU. After making the analysis, it can be said, that their level of working-out is roughly the same. Concepts are concerned with creating better conditions for developing a culture from the side of public administration, which should contribute to the overall improvement of conditions for the cultural development. Most cultural institutions and most cultural activities are carried out at a regional level. Therefore it is important and essential for the future of culture in Slovakia that exactly to these levels will be implemented the systemic measures and solutions, which would then create a mutually coordinated system of cultural policy in Slovak Republic. Made analysis could be an inspiration for working-out similar concepts of cultural development in all higher territorial units of Slovakia.

5 Conclusion

In the European space cultural policy is understood as a state created environment in which the processes of creation, preservation and dissemination of cultural values are carrying out. Cultural policy is perceived as a continuous care of the state of cultural development of the country and population. The fundamental objective of cultural policy is to set objectives, create structures and secure sufficient resources to create a favorable environment for human fulfillment.

Public administration creates frameworks and conditions for the development of culture, provides a basic network of cultural institutions and cultural infrastructure in the area. At the regional level concepts of cultural development are developed, which are concerned with creating better conditions from public administration for developing culture, which should contribute to the overall improvement of conditions for the development of culture in the broadest sense. Concept of cultural development touches all areas of culture (educational activities, museum and gallery activities, drama activities, activities in the audiovisual sector, protection of monuments, library activities and other cultural activities).

It is recommended that states adopt five policy objectives. The main objective is to make cultural policy one of the key components of development strategy. The other objectives touch all key areas of the culture as cultural heritage and cultural industry, support of cultural diversity, participation on cultural life and also issue of financial resources. These objectives became the basis for the analysis and theoretical basis for the evaluation of selected concepts for cultural development of higher territorial units. Made analysis could be an inspiration for working-out similar concepts of cultural development in all higher territorial units of Slovakia, which can help to create mutually co-ordinated system of cultural policy in the Slovak Republic.

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Primary Paper Section: A

Secondary Paper Section: AD, AL

THE SCHOOL CLIMATE EXPERIENCES

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Abstract: This paper analyses the quality of the school climate. One of its objectives is to define such basic terms as environment, atmosphere, climate, and selected climate variants, above all the school climate. Attention is also paid to the following five areas of school life, which are in my opinion of significance: 1) the overall attitude to school and the motivation to study 2) teachers` qualities and competences 3) school rules and the discipline in class 4) the solidarity of the class as a social group 5) the architectural, aesthetic and hygienic aspects of the school. The thesis also wants to present new practical methods supported by long experience of the school climate gained abroad and even by similar experience lately picked up in the Czech republic.

Keywords: school climate, students, teachers, parents, research, questionnaire.

1 The term school climate specification

In our point of view, it is essential to think about the school climate in the wider context. I.e. not just from the perspective of the contemporary events, but also due to the past and with the perspective to the future. All aspects of the school life exist in mutual relation. The processes going on in the school life are the reflection of the changes realized in the past and together with that, they have the adaptational and anticipational character. The processes and circumstances in the school environment should be observed with respect to the contemporary conditions. At once, it is necessary to confront the contemporary state with the perspective and benefit for the future. While judging the school climate, we should therefore study the whole evolution of the school environment.

The experts cannot agree on the fact what the term school climate includes and what it does not. Obdržálek (2002) states, that the school climate is a social-psychological phenomenon which is very complex and exceptionally challenging for the analysis and exploration. Mareš (2000, p. 242) names the school equipment, processes happening in the school, the leadership style, the public reflection of the school, teachers dedication to school and school work; and students specifics as its variables. There have also appeared some provoking opinions that the term school climate is out of use and therefore we should not take care about it. (Finlayson, 1987 in Mareš, 2000, p. 242). We do not share this opinion. Despite these opinions we concentrate on and try to study these problems in the sense of research and from our theoretical viewpoint.

We know that the school climate (in some sources named as school atmosphere, school world, school life, emotional tone, school ethos, school culture, school spirit) depends on the specific situation of the individual school. It is conditioned by the school environment, where we can observe it, analyse it and evaluate. It does not happen but grows continually. It is the phenomenon which is long-lasting, typical for the individual school.

Some authors describe the term school climate as a school culture, informal perception of the processes which take place at school (Deal a Kennedy, 1985 in Aurin, 1990, p. 58). From our point of view, it is not possible to understand the terms school culture and school climate as the synonyms. There is a mutual relationship between school culture and school climate. This relationship is not one-way but mutual. According to Obdržálek (2002) the school climate influences backwards the school culture after some time, it conditions the satisfaction of the school staff, pupils and teachers. The satisfaction positively influences back the culture of school. In case all individuals feel well and satisfied at school environment, the effectiveness of school increases. Good results of school work serve as a motivation for the other activities and fulfillment of set aims. It is possible to confirm the satisfaction of school and their school climate experience participants in the same way.

Spanhel (1993, p. 225) describes the school climate as the perceptional reality or basis, which can be observed at school. Every activity has its meaning in the regular school life. We mainly concentrate on the goal for which the teachers and students would share good relationships in an everyday class and school life, would be able to manage the problems or struggles and solve the set tasks together. All these aspects can be positively influenced by the good school climate. This algorythm works also vice versa. Friendly relations and good mood can help the pleasant school climate. School climate enables the similar perception of the school environment to teachers and students, which they share. We also try to answer the question how we can improve the quality of school and school instruction through good school climate. Every school should try to build its own concept of how to optimalize school climate in everyday school life.

When judging the school climate we are mostly interested in evaluation of the participating individuals, i.e. students and teachers (compare Eckert, 1988, p. 135; compare Saldern, 1991, p. 190). We also perceive the ideas of headmasters, parents, parent association, school founder or state school authorities. When we study school climate, we can also study the objective data about the school. I.e. the number of students, number and size of classes, school organization, student population, school leadership characteristics, teacher education (Bessoth, 1989). These data do not however speak about the relation among students and teachers, about the student and teacher motivation to instructional activities or cooperation among the students. For us, the more important features are the subjective views of the school acteurs, their ways of thinking, attitude orientation, opinions, ways of behaviour or acting etc.

2 The school climate researches

2. 1 The construction of the research method

For the purpose of school climate research we constructed the questionnaires for three groups of respondents – students, teachers and parents. In the process of research method construction we used some published tools of Freitag (1998). The author realized his research by the end of 20th century at 18 German schools, where he analysed the influence of some school climate aspects on the health of students and teachers.

At the preresearch phase we optimalized the research method. After the adaptation we constituted the questionnaires for students, teachers and parents, each of which consists of 50 items. The items are devided into five chosen areas which characterize the school climate.

The areas follow:
1) overall relationship and motivation towards the school (items no. 1 – 9),
2) teacher´s quality and competences (items no. 10 – 21),
3) school rules and the classroom discipline (items no. 22 – 29),
4) coherence of the class as a social group (items no. 30 – 37),
5) architectural, aesthetic and hygienic aspects of the school (items no. 38 – 50).

The respondents reflected on the individual statements by the measure how they agree with the individual item. They circled their response on the scale from 1 to 5 (1 – totally disagree, 2 – more or less disagree, 3 – cannot say, 4 – more or less agree, 5 – absolutely agree).

2.2 Realization and the way of research results proceeding

The research took place at three secondary schools, a grammar school and a pedagogical school in Olomouc region, and a health school in Pardubice region. The sample involved together 960 respondents, as concretely shown in the following table.

Table 1: Schools involved in the research and the number of respondents

School	students	teachers	parents
grammar school	231	27	221
pedagogical school	120	31	0
health school	180	19	131

We examined the evaluation of the school climate areas within the individual groups of respondents. We used one-way factor analysis (ANOVA) with the followed comparison of the mean values through HSD (Tuckey) for unequal sums of comparison within the groups. The gained results were also interpreted through the qualitative approach. In the paper we focus only on quantitative analysis of the gained data.

2.3 Research results and discussion

On the basis of the research results we can assume not just which group of respondents evaluates the studied areas best and which worst. We can also deduce the results in the evaluation of the selected areas.

As the main result common to all involved schools we can say, that the research definitely confirmed the differences in evaluation of the areas of school climate from the students, teachers and parents perspective although the assessment doesn´t differ significantly. Teachers give to school climate areas the best marks, student´s assessment is the worst and parent´s opinions resonate between these two groups.

Also important finding exposes the total assessment of each area. The most positively was viewed by all respondents the first area „overall relationship and motivation to school". The worst of all areas was evaluated the fourth area „coherence of the class as a social group". Even so these findings don´t show any significant differences in results.

These findings are in a simplified way presented in the following table.

Table 2: Assessment of five school climate areas from the view of different groups

groups of respondents	area 1	area 2	area 3	area 4	area 5	all areas average
grammar school						
Students	3,65	3,42	3,32	3,22	3,6	**3,442**
Teachers	4,23	3,78	3,87	3,4	3,98	**3,852**
Parents	3,81	3,56	3,45	3,29	3,62	**3,546**
health school						
Students	3,27	3,19	2,76	2,81	3,08	**3,022**
Teachers	3,69	3,65	3,74	3,31	4,09	**3,696**
Parents	3,49	3,4	3,03	3,02	3,36	**3,26**
pedagogical school						
Students	3,49	3,42	3,31	3,23	3,03	**3,296**
Teachers	4,32	4,06	3,82	3,31	3,36	**3,774**
Average	**3,744**	**3,560**	**3,413**	**3,199**	**3,515**	

To compare the findings from the three secondary schools involved in this enquiry, we can say, that all results are close to average and there are no significant differences in assessment of five school climate areas. Anyway, as we can see in the next table, the best results were found at the grammar school and the worst view is obvious at the health school. In total, the assessment of the school climate appears as slightly positive at all schools.

Table 3: Total assessment of five school climate areas at involved schools

groups of respondents	area 1	area 2	area 3	area 4	area 5	all groups average
grammar school	**3,897**	**3,587**	**3,547**	**3,303**	**3,733**	**3,613**
pedagogical school	**3,483**	**3,413**	**3,177**	**3,047**	**3,51**	**3,326**
health school	**3,905**	**3,74**	**3,565**	**3,27**	**3,195**	**3,535**

In our point of view, some circumstances may occur, which can garble the results of the research. We think that some side factors could play a role in the process of questionaire filling (e.g. personal matters of the respondents) which reflected in the final evaluation of the selected areas of school climate.
However, we do not want to make final conclusion on the basis of these results. We realize that we have to be cautious in the interpretation of the facts. Despite this, we think that evaluation of the selected items of the school climate is more or less optimistic. But we also realize that even the negative aspects of school climate belong to the studied phenomenon. They mean the challenge for improvement and optimalization of the school climate.

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Primary Paper Section: A

Secondary Paper Section: AM

TEMPERAMENT STRUCTURES AS RISK FACTORS FOR TEACHERS' STRESS AND BURNOUT

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Abstract: The purpose of the study was to identify such temperament features and systems of temperament features which constitute a risk factor for stress and professional burnout of teachers. It was assumed that stress and burnout are related to increased emotional reactivity and perseverance as well as decreased endurance and that is possible to single out such temperament structures which predispose to these phenomena. 110 teachers from 9 elementary schools of the Poland took part in the research. In order to measure stress, professional burnout and temperament features the following questionnaires were applied: PJSQ, MBI-II and FCB-TI. It was concluded that high level of stress and burnout tends to coexist with strong emotional reactivity and perseverance, low endurance, and "sensitive" type of temperament.

Keywords: temperament, stress, burnout syndrome, teachers.

1 Introduction

Strelau (2001) claims that there are such traits and configurations of temperament traits that constitute a factor of a relative risk of stress and its negative consequences. A relative character of risk means that it is not enough to have a given temperament trait for pathology to be developed, but there have to appear other factors that in interaction with an individual's temperament increase the probability of diseases and disorders. These factors should be intense and long-lasting like for example the ones people experience in their work environment.

Undoubtedly, various professions are connected with various types of requirements imposed on an individual. They may concern competences or skills that an employee has to have in order to appropriately pursue his/her professional activities. If person does not have suitable resources, for example knowledge, he/she is not able to execute tasks ascribed to him/her. Nevertheless, it is possible to improve one's knowledge and competence and that is why their lack constitutes a risk factor of the occurrence of problems at work that are quite easy to overcome. Another type of requirements imposed on a person in work environment are the ones connected with the necessity to function in specific stimulative conditions. For example, in order to efficiently pursue professional activities of a police officer, a person has to be able to process more highly stimulative conditions than it is required from a librarian. Stimulative conditions in which an individual functions best are determined by temperament. As opposed to acquired abilities, temperament is a factor that is very difficult to change and that remains constant practically throughout one's whole life (Zawadzki, Strelau, 1997). That means that in case of temperament it is especially important to recognize its traits and structures which in a particular work environment increase the probability of disorders.

Temperamental traits are not independent – there are connections that reflect their functional linkage and interaction in the process of stimulation regulation (Zawadzki, Strelau, 1997; Zawadzki, Strelau, 2003). Thus, comprehensive assessment of an individual's adaptation possibilities should not only include temperamental traits, but also their configurations. Central importance for a person's functioning lies in relationships between energetic features of behaviour, first and foremost between emotional reactivity, endurance and activity, because these characteristics determine an individual's possibilities to process stimulations and the level of stimulus provided. Temporal characteristics of behaviour are also important because they constitute a kind of "energy channels" which increase (briskness) or decrease (perseverance) level of stimulation. (Zawadzki, Strelau, 1997).

The main purpose of the study was to identify traits and structures of temperament that constitute a risk factor for stress and burnout in teaching profession as well as traits and configurations of temperament traits that protect teachers against these phenomena.

The study included the following research questions:

1. What is the relationship between temperament traits, stress at work and occupational burnout among teachers?
2. Is it possible to single out temperament structures that constitute the risk of occupational burnout and stress at work? What is their character?

Referring to the results of previous researches (Kozak, 1996 after: Zawadzki, Strelau 1997; Trzcińska 1996, after: Strelau, 2006) and Strelau's Regulative Theory of Temperament (Strelau, 2001) the following operational hypotheses were formulated:

- There is a significant positive correlation between emotional reactivity and perseverance and the level of stress and burnout as well as a significant negative correlation between endurance versus the level of stress and burnout among teachers.
- There is a significant difference in the level of stress and occupational burnout between groups of people with various structures of temperament traits.

2 Method

2.1 Subjects

Subjects were 110 teachers, between 24 and 65 years of age (M - mean=42), employed in 9 primary schools of Poland, located in big cities (N - number of subjects=31), small towns (N=51) and in the village (N=28), with job seniority between a year and forty-five years (M=17).

2.2 Materials and methods

It was a questionnaire-based study. The following questionnaires were used:

Perceived Job Stress Questionnaire (PJSQ) was used to measure occupational stress (Dudek et al., 2004). It is designed to measure an individual sense of occupational stress. It allows for a global assessment of stress at work and ten factors connected with stress: "a sense of burden connected with job complexity", "no rewards at work", "a sense of uncertainty caused by the organization of work", "lack of control", "lack of support", "a sense of responsibility", "physical arduousness", "a sense of threat", "social contacts", "unfriendly working conditions". The questionnaire consists of 55 statements that describe various features of work. Each statement has a 5 - point scale indicating the degree to which a given feature is burdensome, irritating or stressful for a person.

In order to determine the intensity of particular temperamental traits, Formal Characteristics of Behaviour – Temperament Inventory (FCB-TI) was used. It is a questionnaire made by Zawadzki and Strelau (2001) based on the Regulatory Theory of Temperament. The questionnaire consists of 120 items creating 6 scales that measure particular temperamental traits, i.e. briskness, perseverance, sensory sensitivity, emotional reactivity, endurance and activity.

Occupational burnout was measured by Maslach Burnout Inventory (MBI) which authors are Maslach and Jackson (1986). It consists of 22 items and measures three dimensions of occupational burnout: "emotional exhaustion" (9 items), "depersonalization" (5 items) and "personal accomplishment" (8 items). Each item has a 7-degree scale in which: 1 – means "never" and 7 – "every day". Mean values refer to a few times a year, a month, a week. High results in sub-scales of "emotional exhaustion" and "depersonalization" as well as low result in the scale of "personal accomplishment" indicate high burnout level.

2.3 Procedure

On the virtue of an agreement with a head teacher, at the end of Teaching Staff meeting, after a brief explanation by a person carrying out the study, the staff of a chosen primary school was given test sheets and instructed as to how to complete them. The time was unlimited and the participation voluntary. The study was anonymous. Questionnaires were completed in the following order: PJSQ, FCB-TI, MBI-II.

129 teachers participated in the study. Two teachers refused to participate. In seventeen cases not all answers to questions included in the questionnaires were given. As a result, the community sample of 110 teachers was obtained.

3 Results

The statistical analysis was conducted by means of a package – Statistica (version 7.0) The relationship between variables was determined on the basis of Spearman's correlation. In order to single out groups of people with different structure of temperamental traits, k-means clustering analysis was used.
It was stated (Table 1, Table 2) that there is significant positive correlation between emotional reactivity and such variables as: "general level of stress", "stress connected with job complexity", "no rewards at work", "uncertainty", "lack of control", "decreased accomplishment", "emotional exhaustion", "depersonalization".
In case of endurance it was found there is significant negative correlation with complete level of stress at work as well as with "no rewards", "uncertainty", "burden resulting from job complexity", "physical arduousness", "lack of control", "lack of support", "a sense of responsibility" and all components of burnout: "emotional exhaustion", "depersonalization" and "decreased personal accomplishment".
In addition, it was observed the relationship between activity and "stress resulting from job complexity", "no rewards at work", "decreased personal accomplishment", "emotional exhaustion" and "depersonalization". Higher level of activity, understood as a trait of temperament, is connected with lower level of the intensity of these variables.
As far as perseverance is concerned, similarly to emotional reactivity, there was significant positive correlation between this trait of temperament and "general level of stress", "burden connected with job complexity" "no rewards at work", "uncertainty", "no control" and all components of burnout. Analysis showed also significant correlation between briskness , "stress resulting from job complexity", and factors of occupational burnout – the lower level of briskness, the higher intensity of these variables.

variables	briskness	sensory sensitivity	endurance	emotional reactivity	activity	perseverance
General stress	-0,17	-0,00	**-0,46**	**0,33**	-0,15	**-0,17**
1	**-0,30**	**0,05**	**-0,50**	**0,39**	**-0,24**	**-0,30**
2	-0,08	0,08	**-0,44**	**0,35**	**-0,21**	**-0,08**
3	-0,08	0,05	**-0,28**	**0,26**	-0,08	**-0,08**
4	0,04	-0,14	-0,14	0,03	0,02	0,04
5	0,06	-0,17	-0,13	0,08	-0,05	0,06
6	-0,17	-0,00	**-0,46**	0,33	-0,15	-0,17
7	-0,02	0,01	-0,07	0,11	-0,09	-0,07
8	**-0,36**	-0,09	**-0,46**	**0,28**	-0,16	**0,29**
9	-0,17	-0,05	**-0,29**	0,08	-0,09	0,04
10	-0,08	0,03	**-0,23**	0,09	0,01	0,10

Table 1. Correlations between temperament and stress. 1) burden connected with job complexity (2) no rewards at work (3) uncertainty (4) social contacts (5) a sense of threat (6) physical arduousness (7) unfriendly working conditions (8) lack of control (9) lack of support (10) sense of responsibility (bold font - correlations are statistically significant at p<0,05).

variables	briskness	sensory sensitivity	endurance	emotional reactivity	activity	perseverance
1	**-0,32**	0,03	**-0,49**	**0,37**	**-0,27**	**0,32**
2	**-0,28**	0,03	**-0,38**	**0,29**	**-0,25**	**0,26**
3	**-0,39**	0,05	**-0,47**	**0,41**	**-0,30**	**0,35**

Table 2. Correlations between temperament and burnout. (1) decreased sense of personal accomplishment (2) emotional exhaustion (3) depersonalization (bold font - correlations are statistically significant at p<0,05).

In order to single out groups of people with different traits of temperament, k-means clustering analysis was used. Thus, two groups of teachers with different traits of temperament were differentiated (Fig.1). They were defined as a "resistant type"– characterized by high briskness, endurance and activity and low emotional reactivity, perseverance and sensory sensitivity and a "sensitive type" – with high emotional reactivity and perseverance and low activity, briskness and endurance.

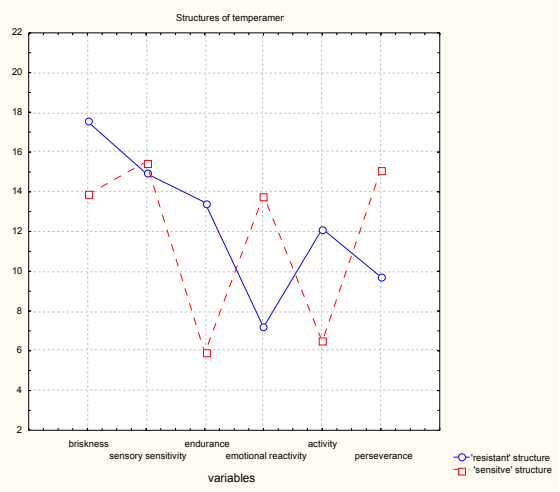

Fig. 1 Structures of temperament.

Significant differences in the general level of stress and also particular components of occupational burnout: "emotional exhaustion", "depersonalization" and "sense of personal accomplishment" were stated between these groups. People with "sensitive" type of temperament declare significantly higher level of "general stress", higher "emotional exhaustion" and "depersonalization" than people with "resistant" structure of temperament (Table 3).

variables	'resistant' -mean	'sensitive'-mean	t	p	N 'resistant'	N 'sensitive'
1	**90,19**	**108,87**	**-4,7**	**0,00**	**42**	**68**
2	**14,98**	**26,72**	**-4,72**	**0,00**	**42**	**68**
3	**16,69**	**24,28**	**-3,62**	**0,00**	**42**	**68**
4	**24,79**	**41,68**	**-5,62**	**0,00**	**42**	**68**

Table 3. Difference in the level of stress and occupational burnout between groups of people with various structures of temperamental traits. (1) general stress (2) decreased personal accomplishment (3) emotional exhaustion (4) depersonalization (N – number of subjects; bold font - differences are statistically significant at p<0,05).

4 Discussion of results.

The purpose of the study was to identify such temperament features and systems of temperament features which constitute a risk factors for stress and professional burnout of teachers. It was assumed that teacher profession is connected with high level of stimulation provided by the work environment. It was also assumed that risk of stress and burnout is increased by temperamental traits associated with low demand for stimulation (such as emotional reactivity) and decreased by traits associated with high capability of stimulation processing (like for example endurance). Because high perseverance is usually associated with high intensity of emotional reactivity (Zawadzki, Strelau, 1997), it was assumed that this trait also should be positively correlated with stress and burnout.
The results of the study did not give any basis to reject the hypotheses made by the author. Emotional reactivity as a trait referring to the ease of reacting with intense emotions and tendency to decrease the level of tasks performed in stressful conditions turned out to be significantly connected with almost all dimensions of stress at work and occupational burnout. It was also observed that higher intensity of burnout and stress is connected with higher level of perseverance, where this trait shows relationship with the same stress factors as reactivity.

No relationship with the level of emotional reactivity was shown by such variables as: “a sense of threat”, “physical arduousness”, “lack of support”, “a sense of responsibility”, “social contacts” and “unfriendly working conditions”. However, the first four factors turned out to be significantly connected with endurance (higher intensity was connected with lower intensity of this trait). Such results would indicate the significance of treating emotional reactivity and endurance as two separate traits and not the ends of the same dimension that determines an individual demand for stimulation.

Lack of endurance determining ability to react adequately under intensive external stimulation seems to have a decisive meaning as to how an individual will be able to meet such requirements and burdens as: loud noise, bad lighting, unsuitable temperature (factor: “physical arduousness”), necessity to perform tasks independently and on one’s own (“lack of support”), exposure to harmful stimuli (“sense of threat”), awareness of serious consequences of mistakes, material responsibility or lack of information about the job (“a sense of responsibility”). These factors are connected to a great extent with the necessity of long-lasting vigilance and concentration as well as putting great effort into the tasks. No wonder that they are perceived by not resistant individuals as burdensome.

Negative relationship between briskness and “burden caused by job complexity” may result from the fact that thanks to easier adaptation of individuals with high level of briskness to external conditions and smaller problems to shift from one activity to another, they perform complex tasks more efficiently. These features also seem to protect an individual from the development of occupational burnout syndrome. Similarly, higher activity is connected with lower burnout and lower “sense of burden resulting from job complexity” and “stress connected with no rewards”. Active individuals, thanks to higher mobility and efficiency in activities, better cope with inconveniences connected with these factors.

Relationships between discussed temperamental traits versus stress and occupational burnout are more comprehensible when we investigate their mutual connections. In the study, by means of the cluster analysis, two basic structures of temperamental traits were differentiated. They were defined as a “resistant type” – characterized by high briskness, endurance, sensitivity and low emotional reactivity, perseverance and sensory sensitivity and a “sensitive type” – with high emotional reactivity, perseverance, sensitivity and low activity, briskness and endurance.

It was shown that people with “resistant” and “sensitive” type of temperament differ as far as the level of stress at work and the intensity of particular components of occupational burnout are concerned. Stress and burnout are higher in the group of people with the structure of temperamental traits characterized by small possibilities to process stimulations. Although a “sensitive” temperament type ensures an individual effective regulation of stimulation (avoiding stimulation and tendency to relieving behaviours with small demand for stimulation), in school environment, particularly burdensome as far as stimulation is concerned, it becomes a factor of risk of stress and burnout.

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Primary Paper Section: A

Secondary Paper Section: M, N,

ATTITUDE OF FIRMS IN MORAVIAN-SILESIAN REGION TOWARD THE SOCIAL AND ENVIRONMENTAL BUSINESS RESPONSIBILITY

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The paper is supported by the SGS research project SP/2010106 „Využití klasických nástrojů marketingové komunikace pro podporu elektromobility v Ostravě".

Abstract: Corporate Social Responsibility (CSR) is a way of managing business and building relationships with partners, which contributes to improving the reputation and credibility of company. The importance of the concept of corporate social responsibility is growing, especially in regions with decreasing quality of environmental conditions. The main objective of this article is to analyze the attitudes of entrepreneurs to social responsibility, particularly in the field of environmental protection, and intensity of application of tools to build socially and environmentally responsible image. The research was held in Moravian-Silesian Region because of high pollution in this region.

Keywords: environmental responsibility, social responsibility, environmental pollution, protection of environment

1 The Socially and Environmentally Responsible Approach

The importance of the social responsibility concept is still increasing. The main reasons of this are the efforts to differentiate from competitors, to increase customer's interest in products manufactured in decent labour conditions considering environmentally-friendly conception, and to fulfil public pressure to improve the environment and society. With the issues of firms' environmental responsibility is concerned also European committee, which consider the concept of corporate social responsibility (CSR) as a tool to meet the goals set on the Lisbon Summit - to become the most dynamic and competitive knowledge economy on the world, to ensure stable economic growth, and to ensure more and better labour positions and higher social coherence till 2010. [5]

The CSR is the way of the corporate managing and building relationships with business partners, which contribute toward the improvement of image and credibility of the particular firm. [1, 4] It is usually based on the triple-bottom-line principle, which involves not only economic, but also social and environmental aspects of the company. [5]

The economic activities of any social responsible company are characterized by transparency and by creating positive relationships with investors, customers, suppliers and other business partners. These companies observe their influences on the local, national and global economic environment by the development of employment or by prevention of corruption. In the social area the companies are focused on their approach to their employees and support of the local community, whereby influence standards of living, health, safety, education, and cultural development of citizens. The environmental responsibility is focused on the protection of natural resources minimising impacts on the environment. [3]

The social responsibility is defined by the European Committee in The Green Book as an activity voluntary integrating social and ecological respects to firms' business activities with cooperation with interested parties – stakeholders. [3] The stakeholders are in this concept subjects or groups, with which the firm effort to build long and credible relationships. These subjects have significant influence on the firm's activities or are by these activities influenced. The classic examples of stakeholders are employees, investors, customers, business partners, public organisations, media, labour unions, public and others. [5]

1.1 Reasons for the Application of CSR Principles

To become the socially and environmentally responsible company brings mostly non-financial advantages. The main reason to apply this approach is to build a trustworthy relationship with company's environment, with employees, potential employees and investors, and to create the image of credible and reliable company, since this image is usually associated with the competitive advantage.

Selected benefits of socially responsible business conduct are:

- opportunity to innovate,
- attractiveness for investors,
- transparency,
- credibility,
- long term sustainability of the firm,
- increased employee loyalty and productivity,
- ability to attract and hold quality employees,
- reputation building. [2]

The credibility of CSR has to be based on following principles:

- personality – differentiate from competitors,
- authenticity – ability to believe in conviction of employees and management,
- transparency – information disclosure,
- consistency – in compliance with the principles. [5]

The socially and environmentally responsible behaviour of any company exceeds the behaviour kept by law. The CSR is a component of the global corporate strategy, not only the activity of a marketing (PR) department.

The significant importance has the CSR approach for smaller and medium firms, which were participated on the research described below. The company that acts responsibly has a greater chance to obtain a suitable workforce. Many university graduates are trying to get a job in big companies, but, by the application of CSR activities, however, a smaller company could take advantage of potential job seekers – university graduates. Corporate social responsibility affects also the supplier-customer relationships. Some of the companies are choosing a business partner regarding compliance with the CSR approach. By using the concept of CSR, the company is building good reputation without spending large resources on communication with the public as is possible in large companies. [2]

1.2 The Communication Tools of CSR Activities

The most applied marketing communication tools by CSR strategy are corporate websites, which involves information, special e-mail addresses, section for stakeholders' questions, and annual reports in printed and electronic version. Other usually used tools are announcements sent by electronic or classic mail, free telephone line, media, PR and paid advertisement. [4]

2 Research Methodology

The main objective of the presented research in the area of the environmental responsibility was to analyse the attitudes of the entrepreneurs towards the responsibility especially in terms of environment protection. This particular theme was a part of the complex study focused on the issues of the utilization of electric vehicles in the companies' fleets.

To collect the primary information electronic questionnaire was designed. To the chosen e-mail addresses was sent an invitation letter with a request to participate in an academic research. This invitation included a hyperlink to the questionnaire form created by using Google Documents tool. The questionnaire contained closed questions with four-point scales (strongly disagree - strongly agree, definitely no – definitely yes) to avoid neutral answers. Respondents were asked to assess the degree of an

agreement with particular statements regarding the issues of social and environmental responsibility of their firm. The research was conducted in two stages in July and August 2010.

Table 1: Characteristics of respondents

Title of respondent	Share	Sector of industry/ business	Share
Owner	61,0 %	Business Services	26,9 %
Executive Director	12,0 %	Car Services	10,8 %
Department Head	15,0 %	Manufacturing	20,4 %
Head of Fleet	7,0 %	Servicing	11,8 %
Other	5,0 %	Building Industries	8,6 %
Size of company (number of employees)		Transportation, Logistics	6,5 %
Micro firms (less than 9)	50,0 %	Catering	3,2 %
Small firms (10 - 49)	31,4 %	Others	3,2 %
Medium firms (50 - 249)	12,8 %	**End-users**	
Large firms (250 and more)	5,8 %	Mainly customers	17,0 %
Company Headquarters		Mainly businesses	53,0 %
Office in Ostrava	54 %	Equally both types	30,0 %
Office out of Ostrava	46 %		

The sample was received from the public company database. The invitation and request was sent to 1,000 companies in Moravian-Silesian Region. The completed questionnaires were 86 (8.6%), which is considered to be good result for an online research. Inquiries were anonymous, but the respondents could fill an e-mail address to obtain the results as a feedback. The structure of the respondents is shown below (Table 1).

3 Results and Discussion of the Findings

3.1 Support of the Particular Areas of CSR

Moravian entrepreneurs mostly support sports organizations and events, social events and disadvantaged residents. Then follow the environmental, cultural institutions and health care is supported at least.

Interestingly, sport events are strongly supported by respondents' firms, disabled residents were rather not supported and other areas of social responsible activities were mostly not supported at all, which refers to the extremes in the responses. Support of the sport events statistically depends on the size of organisation. Large and middle sized firms are using sport events as a CSR tool mostly than small or micro sized firms.

The evaluation of the respondents, whether their company is social responsible or not, is influenced by the degree in which the company supports disabled residents (Table 2). It may also indicate that this area is at most perceived as a part of the CSR by respondents. Probably very slightly affects the dependent variable (assessment of the degree of CSR in firm) support of cultural institutions (Sig. 0.067).

Table 2: Influence of the CSR areas to the evaluation of social responsibility

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	2,103	,298		7,048	,000	1,508	2,698
Cultural institutions	,188	,101	,234	1,858	,067	-,014	,390
Social events	-,013	,091	-,019	-,142	,887	-,195	,169
Sport clubs and events	,038	,097	,054	,390	,698	-,156	,231
Disadvantaged residents	,225	,097	,287	2,328	,023	,032	,418
Health care	-,136	,141	-,124	-,965	,338	-,418	,146
Environment protection	,099	,104	,119	,951	,345	-,109	,307

a. Dependent Variable: Is your firm considered to be socially responsible?

Different areas of support were compared regarding the size of the particular firm. We found that micro- and small organizations support mostly sport and social events and disadvantaged residents in contrast to medium-sized enterprises, which support rather environment protection than disadvantaged people.

According to research results, 46% firms more and 30% definitely consider to be socially responsible. Whether the company is considered to be socially responsible depends on the industry (Pearson chi square coefficient 0,005). Firms in business services have evaluated their social responsibility strongly positively and, more than expected, there were a number of answers "definitely yes" in manufacturing and transportation companies. Companies operating in these sectors are considering themselves to be more socially responsible.

3.2 Marketing Communication and Image Creating

Of communication tools, which are usually used by the firms to promote socially and environmentally responsible activities, firms are mostly applying corporate websites, sponsoring, ISO certificates and advertising (Table 3). Interesting is, that 65 % of micro-sized firms are using websites to create a socially responsible image. The sponsoring is a tool, which is used by micro-sized firms at least. In terms of industry sponsoring is mostly used by firms enterprising in services, manufacturing, building and transportation.

Table 3: Usage of communication tools

Order	Communication tools	Rate of usage	Average*
1.	Websites	77,5%	3,1
2.	Sponsoring	72,5%	2,9
3.	Efforts to obtain the ISO	57,5%	2,3
4.	Advertising	52,5%	2,1
5.	PR articles	47,5%	1,9
6.	Packaging	40,0%	1,6
7.	Corporate magazines	35,0%	1,4

*1 – definitely not, 4 – certainly yes

The ISO certification also depends on the firm size (Pearson chi square coefficient 0,031). This tool is definitely used by medium and large-sized firms, which is probably caused by organizational and financial intensity of the certification. PR articles are mostly used by large firms. Also the usage of corporate magazines as a tool to promote the firm´s social responsibility depends on the size of the company (Pearson chi square coefficient 0,000). The corporate magazines are definitely not used by 89 % of micro-sized firms, 76 % of small-sized firms and 56 % of middle-sized firms. The half of large firms is using corporate magazines. The usage of the advertising depends on the end-user market of the particular (Pearson chi square coefficient 0,026). Up to 77 % of firms on B2B market is definitely not using advertising as a tool for CSR promotion. The intensity of using of product packages is also depending on the firm size (Pearson chi square coefficient 0,001) – the package is used as a promotion tool by a half of large firms.

The results of this research showed, that the entrepreneurs tend to inform about their social responsible activities and appreciate its importance for the image and reference creating. Micro- and small- sized firms are almost not being in contact with media, but they realize the necessity to inform about their acidities and strengthen relationships with stakeholders.

3.3 Environment Protection

According to the research results, 60 % of companies solve the impact of its activities on the environment. The intensity, in

which the firms deal with this issue, depends on the size of firms (Pearson chi square coefficient 0,018). All large companies and 91% of medium-sized companies are resolving the impact of secondary effects of their activities on the environment; only 44 % of small companies and 57% of micro firms are environmentally responsible. It is logical, because larger firms are more polluting and requirements on environmental pollution reduction are constantly increasing.

52% of respondents said that their company does not use natural resources rationally. Interestingly, 60% of micro firms, 52% of small firms, but only 36% and 25% medium-sized firms do not use natural resources rationally, according to the respondents.

More than 60% of companies had not officially set rules of the environment protection, but according to research results, more than half of firms acquainted employees with environmental policy. Employees are familiar with environmental policy more in medium and large companies, particularly in the manufacturing (65%), construction (75%) and transport (80%) industry. In terms of official environmental policy could be observed dependency on industry (Pearson chi square coefficient 0,038). Rules are primarily set in manufacturing companies (43%), the construction companies (50%) and transport companies (up to 80% of transport firms answered "certainly yes").

It is positive, that 62% of companies use the new environmentally friendly technologies. Using the new technology increases with the number of company employees; 60% of micro and small firms, 73% of medium firms and 80% of large companies apply new technologies to protect the environment. The environmentally responsible policy influences also the choice of business partners. Even up to 73% of firms prefer business partners who have formally set goals for environmental protection, which also depends on a size of the firm (Pearson chi square coefficient 0,033). 46% of micro firms and 26% of small businesses do not. The results show that more than half of companies consider the business partners' approach to the environment.

Respondents were also asked about their attitude toward the environment policy as a competitive tool. It is interesting that 62% of companies do not think that a policy of environmental protection is important to their customers (30% answered "definitely not"). According to the industry, these responses were most often by the firms offering business services (61%), manufacturing (37%), car services and maintenance services (both 29%).

Correlation analysis showed that between the statement "employees are familiar with environmental policy" and statement "firm officially established rules to protect the environment" is a strong positive linear relationship (r = 0.794). The more is environmental policy important for customers, the more activities in setting the official rules for environmental protection company makes (r = 0.514) and more prefer environmentally friendly business partners (r = 0.569).

On the evaluation of the firm's environmentally protective activities has the greatest impact rational use of natural resources. Probably a very slight effect on the dependent variable will have the fact that the company has officially established rules to protect the environment (Table 4).

Table 4: The influence of particular activities to overall impact on the environment

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1,345	,384		3,501	,001	,578	2,112
	Rational usage of natural resources	,305	,107	,340	2,854	,006	,092	,518
	Company officially set the rules of environment protection	,288	,156	,345	1,844	,070	-,024	,599
	Employees are familiar with the protection policy	-,156	,159	-,178	-,978	,331	-,474	,162
	Firm uses new environmentally friendly technologies	,038	,140	,034	,272	,786	-,242	,318
	Firm prefers business partners applying environmental policy	,042	,145	,037	,290	,773	-,248	,332
	For our customers is our environment policy important	,110	,127	,115	,868	,389	-,143	,364

a. Dependent Variable: The impact of firms´ activities on the environment.

4 Conclusion

The research shows that both micro and small enterprises, as well as medium-sized enterprises located in the Region, effort to support the environment in which they operate. This demonstrates that CSR principles are not used only by the large, international corporations, which are faced with media interest. Differentiation of the intensity of CSR varies due to financial and organizational capabilities. However, it is important to encourage and help entrepreneurs in these activities, respectively CSR, to become part of corporate strategy. Moravian firms often support sports organizations and events, social events and disadvantaged residents, and at least health care.

In the region 46 % firms are likely responsible and 30 % definitely consider to be socially responsible. The social responsibility is certainly considered particularly in manufacturing and transport companies. The greatest influence on the evaluation of the respondents, whether they consider their company as socially responsible, has support for disadvantaged residents. This probably explains which area of CSR is the most important in terms of social responsible strategy. Research results show that companies are trying to inform about their socially responsible activities and recognize its importance for the reputation of the company. Micro and small enterprises do not come into close contact with the media, but they also recognize the need to inform about their activities and use corporate websites and sponsorships. The most used communication tools for this purpose are generally websites, sponsorships, advertising and ISO certification.

The main impact on the assessment of environmental responsibility has the rational usage of natural resources. The survey showed that only 60% of companies address the impact of its actions on the environment. These are mainly large and medium-sized businesses. More than half of respondents said that their company does not use natural resources rationally, which concerns 60 % of micro firms and 52 % of small firms. Therefore it is necessary to encourage small and micro businesses to more responsible approach not only by legislative constraints, but also by pressure from the public organizations and independent associations.

More than 60% of companies have not officially set rules to protect the environment, but according to research results, more than half of employees are familiar with environmental policy. Familiarity of employees with environmental policy and establishing rules for environmental protection is mainly used in medium and large firms, operating mainly in transport, construction and manufacturing. Companies operating in these sectors contribute to pollution of the environment more than

firms in other areas of the economy, but the companies´ effort to reduce its impact on the environment should be applied also in other sectors. It was also found that official implementation of rules to protect the environment has impact on the employees' familiarity with these activities. It is therefore necessary not only to provide rules, but also to implement and follow them to ensure the principles of authenticity and credibility.

A part of the environmentally and socially responsible policy is the choice of business partners. The results show that most companies have respect to their partners' approach to the environment. Even up to 73% of firms prefer business partners who have formally set goals for environmental protection.

Although most respondents do not consider the environmental policy is important for their customers, and do not perceive this behavior as a source of competitive advantage, it is necessary to keep a greater extent in informing the public about the intensity of environmental pollution and ways to reduce the impact of companies' behavior on the environment and encourage entrepreneurs in their pursuit of responsible policy that will positively affect not only the environment but also society and prosperity of companies.

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Primary Paper Section: A

Secondary Paper Section: AE

COMPETITIVENESS AND INNOVATION IN KOŠICE REGION

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Abstract: The main objective of the enterprise in a market economy is to ensure its economic and commercial success, a crucial prerequisite for its competitiveness and innovation level, which constitutes the decisive factor. Competitiveness of Slovak small and medium-sized enterprises after the accession to the EU is a very important indicator of their maturity. Analyzed study gives an overview of the results of assessing the level of innovation taking place in the subjects of small and medium enterprises in Košice region, whose competitiveness is relatively low. The paper analysis the situation of the issue in the enterprise and solution proposals, which should be complied with State and the other institutions helpful in overcoming the initial barriers to full integration of our businesses in the EU single market environment.

Keywords: Competitiveness. Innovation. Innovative behavior of enterprises. Small and medium-sized enterprises. Region Košice.

1 Competitiveness and innovation

Competitiveness of the region can be defined as the ability to produce products and services that will stand in international relations and is also secured the maintenance of high and persistent income of its residents. Generally, we define the competitiveness as the ability of firms, industries, regions, nations and supranational regions to generate high levels of income and employment. (Hudec O., 2007).

With rising number of foreign direct investment, there is a continuous trend of gradually declining unemployment rate in the region (for example can be given almost all the municipalities in Slovakia). We must however note that besides of the competitiveness of the regions there are also many other factors, but foreign direct investments guarantee a steady increasing competitiveness of the region.

According to Moses [2] competitiveness is not just a corporate fight. This is a fight for any position or resources. By this regard, all the cities or regions can compete. Camagni [3] argues that globalization affects not only companies but also the territory between them more and more by competing in the production and acquisition of producing factors.

Similarly, according to the European Union [4] the competitiveness is defined as region's ability to produce products and services that are sold at international markets and create high and sustainable incomes for higher employment. According to the definition of the European Commission [5], the region's competitiveness is seen as an equivalent to the economy's ability to offer its citizens an improving standard of living, high employment and a sustainable level, so the European Commission is inclined to think that the basis of competitiveness of the region is accompanied by productivity growth and by maintaining high employment.

The term "innovation" in technical terminology began appearing several years ago in connection with the issue of growth theory. First, more complete explanation of the concept of innovation introduced into economic theory appeared in the work of JA Schumpeter "Theory of Economic Development" from 1911. Author of this term understands the activity of the entrepreneur who introduces the the national economy by “new combinations” (as he called innovations) from a position of simple reproduction (circular motion) to the development of economic growth - thus an extended reproduction.

Such complexes activities constitute the new production methods, new markets, new materials, new products and new production organization, which was later in the book Business Cycles (1936) called by the term "innovation".

1.1 Results

Industry - current
Košice region is economically one of the less developed areas of the Slovak Republic and it is also between the 10 least developed regions of the European Union. In terms of potential of economic power, it is the second largest province in the country. In these regions, there are several major companies from the fief of the steel and engineering industry and automobile industry, wood-furniture, food, electronic industry.

By economic activity (NACE), we contacted 53 respondents, who helped to map the situation in the Kosice Region. The largest proportion of respondents active in manufacturing was (33.96%), followed by construction sector (16.98%), 13.23% are businesses in hotels and restaurants. At the same level there are the enterprises in the wholesale and retail businesses and in education (9.43%).No less important, but a smaller group of businesses are businesses in the arts, entertainment and recreation (7.55%). Agricultural, professional, scientific and technical activities represent 3.77% of total holdings. The smallest representation (1.88%) has transport and storage (Table 1).

The groups of respondents were mostly from the district of Kosice (28 companies), representing 52.83% of the total numbers of businesses, Michalovce district were involved in 9 enterprises, it is 16.98% of the total number of entrepreneurs. The fifth additional business was from the district Spišská Nová Ves, which is 9.43%, Trebišov and Rožňava districts are represented by four companies - 7.55% of the total. Smaller districts such as Sobrance (2 companies) and Gelnica (1 company) form 3.77% and 1.89% of the total.

Table 1: Distribution of enterprises by NACE

	Number	%
Agriculture	2	3,77
Industrial production	18	33,96
Construction	9	16,98
Wholesale and retail trade	5	9,43
Hotels and restaurants	7	13,23
Transport, storage	1	1,88
Professional, scientific and technical activities	2	3,77
Education	5	9,43
Arts, entertainment and recreation	4	7,55
Total	53	100

Source: Own processing

In analyzed companies, we evaluated also the length of these businesses. In this mapping surveys may be concluded that in the range of 10 to 15 years there are around 74% which are considered to have stabilized economy. Businesses that have existed for more than 15 years, represent the second largest group (14%), and entrepreneurs who undertake less than 10 years constitute the third group with 12%.

The questionnaire survey consists of small enterprises with 10 to 49 employees 62%, which represents the largest group. The second largest group consists of businesses with 50 to 249 workers, and to 21% and the third group consists of businesses with 0-9 employees, only 17%.

SMEs and innovative capacity
In the past, people carried a large proportion of manual labor, but machines do it today - thanks to knowledge. The new information society and its size is less important than flexibility and dynamics of corporations. The importance of research and development and the need for specific innovative services lead to creation of scientific and technological potential enable for the development of information capabilities. Companies are forced to search for a specific human resources, therefore, often entering external markets work or cooperate with universities and secondary schools, to draw attention to their potential skilled employees.

According to Peter F. Drucker (Drucker, 1985), innovation can be broadly defined as the process of securing new and better skills or more useful. Innovation is not the science or technology, but a value that can be measured by impact on the environment. Drucker wrote that in terms of management there are only two basic functions: marketing and innovation. While the marketing function is to satisfy current customer needs, innovation is trying to meet future customer needs. Without the ability to constantly innovate business can vanish when the needs of the costumer or the competition change.

The question we asked our respondents regard to innovation in the company over the past 5 years was responded as follows (Table 2).

Undertakings engaged in agriculture in the questionnaire survey replied that over the last five years has introduced a new technology, and also upgraded the existing technology in business. Survey attended by 18 enterprises (100%) of the manufacturing sector, of which 16 enterprises (88.88%) introduced totally new technology, a large proportion of these enterprises, 2 enterprises (11.12%) innovated the technology used so far. Of the 9 enterprises in building four businesses put in place over the past five years a completely new technology in the enterprise (44.4%), 3 enterprises during this period, decided to upgrade to date technology (33.33%) in 2 companies (22, 22%) they have not seen any technological innovation. In the 2 companies (40%) in the wholesale and retail are the last 5 years recorded upgrading existing technology and in the remaining three companies (60%) have not made any technological innovation. Four companies - 57.14% hotels and restaurants upgraded over the past 5 years to date technology and 3 companies (42.86%) upgraded. One company engaged in the transport and storage (100%) has not made any technological innovation. Enterprises of industry expertise, scientific and technical activities said that over the last five years had implemented the innovation of the existing technology. (100%). In the educative sector, two companies (40%) have introduced a new technology, and 3 companies (60%) said that the nature of the business precluded any innovation. Of the four companies in the arts, entertainment and recreation one company has introduced over the past five years a completely new innovation in the enterprise (25%) and 3 undertakings during this period did not reveal any technological innovation (75%).

Table 2: Technology Innovations in SMEs (NACE)

	Innovation Technology	No innovation	Introducing a new technology	Nature and Technol. excludes innovation	Number of enterprises
Agriculture	2	0	2	0	2
Industrial production	2	0	16	0	18
Construction	3	2	4	0	9
Wholesale and retail trade	2	3	0	0	5
Hotels and restaurants	4	3	0	0	7
Transport, storage	0	1	0	0	1
Professional, scientific and technical activities	2	0	0	0	2
Education	0	0	2	3	5
Arts, entertainment and recreation	0	3	1	0	4
Total	**15**	**12**	**25**	**3**	**53**

Source: Own processing

During the reporting period, most companies have introduced an entirely new technology (47.17%) 28.30% of companies in the period of 5 years created an innovative technology, 22.64% of companies are not upgraded and 5.66% of enterprises had a negative nature and technological innovation. Innovative technologies were realized mainly in agriculture, manufacturing, professional, scientific and technical activities and also education, new technologies were introduced in the manufacturing, construction and agriculture, but also in education. We assume that the use of new, respectively innovative technologies inevitably contribute to faster development of these companies. Businesses whose nature of the technology used precludes any innovation exist mainly in the field of education. Almost half of the enterprises, i.e. 25 introduced a completely new innovation for the past 5 years, 15 enterprises innovated over the past five years the technology used so far in the enterprise and 3 enterprises nature precludes any technology innovation.

The next question related to product innovation as the results of production activities in SMEs (Table 3).

Table 3: Product Innovation in SMEs (NACE)

	Innovation Technology	No innovation	Introducing a new technology	Nature and Technol. excludes innovation	Number of enterprises
Agriculture	2	0	0	0	2
Industrial production	3	2	14	1	18
Construction	1	2	4	2	9
Wholesale and retail trade	2	2	1	0	5
Hotels and restaurants	3	1	3	0	7
Transport, storage	0	1	0	0	1
Professional, scientific and technical activities	1	0	1	0	2
Education	2	0	2	1	5
Arts, entertainment and recreation	1	2	1	0	4
Spolu	**15**	**10**	**26**	**4**	**53**

Source: Own processing

The agricultural sector provides enterprise product innovation over the past 5 years. Of the total number of 18 enterprises from the manufacturing sector, 14 businesses put in place a completely new product (77.77%), while 3 of them have upgraded the product so far (16.66%), 2 not upgraded (11.11%) and 1 enterprise nature secreted product innovation was (5.55%). In construction, 4 enterprises introduced a completely new product (44.44%), 2 enterprises upgraded at all (3.77%) and also the nature of their product innovation excluded (3.77%) over the past five years, and one company has innovated (1,89%). The wholesale and retail businesses did not upgraded 2 (3.77%) and also upgraded an existing product (3.77%), and one company has introduced a completely new product (1.89%). In the field of hotels and restaurants 3 enterprises upgraded product so far (5.66%), and 3 enterprises introduced a completely new product (5.66%), while one company was innovating at all (5.55%). In the transport and storage firm innovating, it was at all (5.55%). In the field of professional, scientific and technical activities, one firm has innovated a present product so far (5.55%) and one company has also introduced a completely new product. In education, we contacted the five businesses - 2 enterprises have introduced a completely new product (3.77%) and 2 enterprises also innovated the product so far (3.77%), while one company with the nature of the product eliminated the innovation.(5.55%). The last topic was art, entertainment and recreation, in which our respondents answered as follows: 2 enterprises did not innovate at all (3.77%), one company has introduced a completely new product (5.55%) and also one company has innovated an existing product (5, 55%).

For a summary of the responses of our respondents, the small and medium-sized enterprises in this survey for the last five years decided to innovate as following:

26 enterprises have introduced a full product innovation,

- 15 enterprises have innovated product so far,
- 10 enterprises ever upgraded,
- 4 enterprises preclude product innovation.

2 Conclusions

Proposed measures for innovation activities KR:

- Set the direction of SME International - an open EU market, as well as foreign firms can contribute greatly to solving innovations.
- Provide more space for customers who are gro new ideas and insights to effectively innovate.
- Focus on end-consumer.
- Targeting of language differences and language barriers and deepening of knowledge for the purpose of creating an effective communication and relationships in the external environment.
- Build qualitative information systems that would help to respond to trends in the shortest possible time.
- Control under the new EU standards, which determine the degree of innovative devices.
- Promoting research activities linked to the budget through the creation of these purposes and subsequent cooperation with universities.
- Support the development of educational, scientific - technical innovation activities and building of industrial parks.

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Primary Paper Section: A

Secondary Paper Section: AH

DISCUSSING THE SUNK COST FALLACY: TOWARDS A HIERARCHICAL CONCEPT OF RATIONALITY IN MANAGERIAL DECISION-MAKING

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Internal grant: "Analysis and design of evaluation and selection system of public tenders suppliers"

Abstract: An assertion widespread in economics, psychology, and management maintains that giving weight to sunk costs is irrational. However, there is a growing discussion which points to some aspects of such behaviour which may indicate that under certain circumstances giving weight to sunk costs is not irrational. In this article I suggest that the above mentioned discussion has wider implications for practical and theoretical management. When dealing with the rationality of management actions, assessment of their rationality is always connected with their value, organizational and cognitive context. I propose a concept of hierarchical rationality which respects the ambiguity of context and various goals and values both individual and organization may follow. Such a concept offers for management some practical impulses.

Keywords: Rationality, management decision-making, sunk costs, sunk costs fallacy

1 Introduction: Definition of the sunk cost fallacy

Imagine a major project in which your organization has already invested quite a significant amount of resources represented by finance, personnel, time, and knowledge. The project was already supposed to be finished but for any reason this is not true – the leadership of your organization is just having a meeting in order to discuss the next steps within the project. The main question is: "Shall we continue the project in order to finish it finally, or should we cancel it since it is obvious that to finish it we would need to use inadequate amount of additional resources?" Eventually the decision is to continue with the project because "so many resources have been already invested that we simply must finish the project".

What is described above is an illustration of what is usually called a "sunk cost fallacy" (hereinafter SCF) or "giving weight" (Kelly, 2004) to costs that have already been incurred in the past and cannot be recovered. A practical (yet insufficient as we will see later) definition describes this phenomenon as follows: "When large projects overrun their schedule and budgets, the original economic case no longer holds, but companies still keep investing to complete them." (Roxburgh, 2003, p. 34)

Such behaviour is often referred to as irrational. Whether to consider it irrational or not does have some practical implications as it may be related to some of the most significant projects or activities societies and organizations face such as foreign market entries, major infrastructure projects financed by both public and private capital, or even waging wars. In such projects the amount of resources spent is enormous (absolutely, as it is in the case of say building nuclear power plant or conducting a war, or relatively compared to the available resources of the respective organization or organizations responsible for such a project).

The definition of the sunk cost fallacy can be given in two different ways which, as we will see later, is quite important for the discussion of the correctness of the claim that SCF is irrational. There can be a wide and a narrow definition provided:

1. "Giving weight to sunk costs in decision making" (Kelly, 2004) or "a greater tendency to continue an endeavour once an investment in time, effort, or money has been made" (Arkes – Blummer, 1985) (wide definition).

2. Continuing the already started projects for the sake of the already invested resources (narrow definition). (Kelly, 2004)

The difference between these two approaches or definition lies in the fact that the wider definition leaves open space for various reasons for continuing the already started projects (for instance keeping one's self-esteem thanks to kept promises to finish the project). These reasons allow us to challenge the claim of the irrationality of SCF. What's more the wider definition will allow us to draft the concept of hierarchical rationality.

2 Challenging the claim of irrationality of honouring sunk costs

The claim that honouring sunk costs is irrational has been already challenged by various authors. Their approach and the arguments they raise differ yet one can conclude that their main points is as follows: there are certain conditions under which the claim of irrationality of honouring sunk costs is or at least may be incorrect. This is in accord with the wider definition of SCF (see above).

Nozick (Nozick, 1993, p. 21-25), from his rather philosophical point of view, proposes that an individual giving weight to sunk costs may be better off because it helps him to overcome temptations. He even proposes using the tendency of honouring sunk cost intentionally in order to drive future behaviour: "If I think it would be good for me to see many plays or attend many concerts this year, and I know that when the evening of the performance arrives I frequently will not feel like rousing myself at the moment to go out, then I can buy tickets to many of these events in advance, even thought I know that tickets still will be available at the box office on the evening of the performance. Since I will not want to waste the money I have already spent on the tickets, I will attend more performance than I would if I left the decisions about attendance to each evening. (…) Knowing all this, I purchase the tickets in advance in order to drive myself to attend." (Nozick, 1993, p. 22)

In more general fashion Nozick comments on the irrationality of SCF: "This may be a correct rule (not respecting sunk costs – my comment) for the maximization of monetary profits, but it is not an appropriate general principle of decision (…). We do not treat our past commitments to others as of no account except insofar as they affect our future returns, as when breaking a commitment may affect others' trust in us and hence our ability to achieve other future benefits; and we do not treat the past efforts we have devoted to ongoing projects of work or of life as of no account (…). Such projects help to define our sense of ourselves and of our lives." (Nozick, 1993, p. 22) Such a comment can be understood either as an opposite to purely economic interpretation of the sunk costs phenomena or its enhancement.
Kelly (Kelly, 2004) also proposes some challenges to the assessment of SCF as purely irrational and concludes that under some conditions honouring sunk cost can be advantageous.

The first example is derived from the game theory. If a party is in conflict with much a stronger opponent it may try to inflict as much damage (or costs which the stronger party must expend) as possible. This way the weaker player may hope that continuing the struggle may become too costly for the stronger one so he gives up. Now think of what the stronger may do: by honouring the costs already expended ("we cannot give up after so many resources have been spent") it may make clear to the weaker player that inflicting more damage will not help him. In contrary, inflicting more and more damage to the stronger side will only increase its motivation for continuation of the conflict. Kelly (Kelly, 2004, p. 66) illustrates it by an example of the War in Vietnam: "The Communists succeeded in making it clear to the United States that continued pursuit of its objectives would result in significant costs, costs that were ultimately judged to be not worth bearing." He concludes that in such situation (conflict between a stronger and much weaker side which may try to inflict as much damage as possible in the hope of the stronger side gives up due to too large cost) the stronger player is better off if he is a "pure honorer of sunk costs" (Kelly, 2004, p. 66). Kelly describes then the way such an agent may possibly argue:

"The more resources he has invested in pursuing a given course of action in the past, the stronger the reasons he takes himself to have to continue that course of action now and in the future (so long as there is any hope of achieving the relevant goals at all)" (ibid). Obviously "while the typical terrorist tactic of maximizing inflicted costs is an effective strategy against the expected utility maximizer, it is utterly counterproductive against the pure honorer of sunk costs" (ibid)

One could of course argue against such a conclusion by pointing out to the goals of such hypothetical terrorist: As long as their goal is clearly defined and tied to a decision of the terrorized subject (e.g. leaving certain region or giving up in a war) the pure sunk-costs is better off. But when the goal of the terrorists is just to cause as much pain as possible (e.g. in order to "punish" the nation for any reason) such a strategy is pointless and even suicidal. What we can learn from this discussion is that any potential challenge to the irrationality of SCF should be thoroughly analyzed before accepted. We will discuss this point later.

The second Kelly's challenge to the irrationality of SCF is concerned with the role knowledge of the past plays in the current decision making. An inseparable part of SCF is the agent's respect to past – what he did in the past influences the way he is deciding now and thus what he will or will not do in the future. Common description of SCF claims that one should not take into account what has happened in the past and just take into account what is going to happen from now on. Kelly (Kelly, 2004, p. 71) shows that there are circumstances under which taking the past into account is advantageous for the agent: "In cases in which past investments in a given course of action influence the probability that that course of action will be successful if continued, a decision-maker deliberating behind a veil of ignorance will be at a disadvantage." I find this comment rather subtle because it refers to agent's knowledge of past rather than to his respect to the investments he did. It may be difficult to draw a clear demarcation line between knowledge of and respect to, nevertheless it is clear that there is difference between these two concepts.

The third challenge given by Kelly I would like to mention is the one concerned with giving sense to one's past deeds: "…present actions can affect the significance of past events in ways that matter deeply to us (…) that is, knowledge of sunk costs is essential to the fulfilment of certain preferences. (…) One might prefer that, if others have made significant sacrifices in attempting to realize some valuable state of affairs S, then their sacrifices not be in vain. (…) if I do have such a preference for redemptive actions, then being ignorant of sunk costs will effectively frustrate my ability to satisfy it." (Kelly, 2004, p. 73-4). This notion challenges the concept of SCF by emphasizing that an agent may have preferences which (1) take the past into account, (2) content of such preference is not purely economic (compare with Nozick's point about the rationality assessment in terms of economic and more general criteria).

It is not the task of this paper to provide a complete review of the challenges to the irrationality of SCF, yet we can conclude now on the challenges discussed above:

1. When discussing the challenges to the assessment of SCF as irrational one observation becomes clear: these challenges may work with the wide definition of SCF. In other words it does not seem to me that any of the challenges mentioned would question the narrow definition.

2. The challenges made often include criteria which may not be perceived as purely economic. Or in other words – the criteria used for challenging irrationality of SCF or only related to profit or similar criteria which are usually used when illustrating SCF's irrationality.

3 Hierarchical approach to rationality

3.1 Assessing rationality of agents in the world of complex contexts

Economic subjects – as defined by classic economics – are supposed to maximize their utility. In other words they are supposed to pursue their goals in the most efficient and effective way. If they do so they are to be evaluated as behaving rationally. Yet there are quite many aspects of agent's behaviour which make this basic reasoning quite complex. Consider the following examples: What perfectly meets the goals of an organization's sub-unit may be in contrary to the whole organization's goals (e.g. decreasing the number of people responsible for recruitment may help meet the recruitment manager his cost saving goals but undermine the whole organization's goal to have quality human resources at its disposal), what is quite rational in the short term may be irrational in the long term (e.g. saving on machinery maintenance) or what is rational for a company may not be rational for the whole society (e.g. saving on safety which may result in leakage of poisonous substances).

The extent to which certain activity may be assessed as rational or irrational based on its goal and value concept can be illustrated by some of the challenges to the irrationality of SCF provided by Nozick and Kelly in chapter 2. Their challenges include values an agent may respect, knowledge agent has and may need for successful decision making as well as the "game" (as used by game theory) the agent is involved in.

3.2 Proposal of hierarchical rationality

The natural question now is as follows: How could we assess rationality of an agent given such a complex environment (not mentioning that the description of this environment in this paper is far from being complete)? In order to answer this question I propose the term hierarchical rationality. The term encompasses two findings related especially to assessing rationality in organizations and within managerial decision making:

1. Rationality of certain activity can only be completely assessed within a well defined context of goals and values.

2. Within practical management there are various such contexts represented for instance by various levels of organizations or timeframes.

Resulting is the concept of hierarchical rationality i.e. not one rationality as a universal measure by which agent's decision-making and activities are evaluated but a set of layers of rationality which enable to move from one level to another one. At every level agent can be evaluated. Agent is evaluated within one level, and the rationality of one such a level is evaluated by the superior level and so on.

3.3 Illustrating hierarchical rationality

In the following text I would like to illustrate the complexity of context which in my opinion implies the need for hierarchical rationality or similar concept.

When discussing Kelly's challenge to the irrationality of SCF in the context of game theory (and the example of the War in Vietnam or fighting terrorism) I stated that the potential success of the pure sunk-costs honorer is quite dependent on the goals which the weaker side in the conflict pursue. As long as the goals is bound to the decision of the stronger party the pure sunk costs honorer is better off – and vice versa. We can conclude that without knowing the exact context (the relation between the goals of the weaker part and the decision of the stronger one) we cannot decide whether the agent's behaviour is rational or not. But even without that we can assess at least agent's process rationality (one level below): To which extent is the agent trying to understand its context, the motivation of the stronger party etc. I.e. we can assess agent's rationality on lower level without being able to assess it on the upper one. The productivity of the concept of hierarchical rationality is clear here as it enables us to

decrease our entropy when assessing agent's behaviour (without being stuck in endless discussions about the upper level rationality).

Some of the implications/aspects of the SCF phenomenon may be revealed when we discuss it in a context which is rich in values which may be perceived in a significantly different way by different evaluators/agents. Kelly (Kelly, 2004) quite often refers to the discussion which took place in the United States about the appropriate strategy for the Vietnam War. The decision in question was whether to continue the war or to withdraw. The part of this discussion were arguments mentioned by Kelly: "The United States has invested much in attempting to achieve its objectives. In addition to the many millions of dollars that have been spent, many thousands of lives have been lost, and an even greater number of lives have been irreparably damaged. If the United States withdraws from Vietnam without achieving its objectives, then all of these undeniably significant sacrifices would be wasted." (Kelly, 2004, p. 62) The counterargument may of course be that every other human lost in the conflict represents a value which cannot be counterbalanced by the previous sacrifices. However, it is difficult to agree with Kelly's conclusion that "(...) the fact that many lives have been lost in the past cannot provide a reason for favouring one course of action (continuing the war – author's comment) over another (withdrawing – author's comment)" (Kelly, 2004, p. 63). We could propose a hierarchy (or even hierarchies) of rationalities according to which withdrawal or non-withdrawal from Vietnam could be assessed. We could for instance start with short-term military goals, then go on to long-term military goals, continue to long-term political goals (as defined by valid foreign policy) and end up with deep values ingrained in the US policies. Obviously, it is quite unlikely that a common agreement would be reached even if such a hierarchy would be employed – but certainly the discussion would be much structured than the one represented by Kelly.

Third of Kelly's comments (the concept of redemptive action) is quite interesting as it inevitably leads to the need for hierarchical rationality: If one has a preference of the actions of others not be in vain, it may result in respecting SC. But is such a preference rational? It is impossible to answer this question unless you know the goals or values to which such a preference can be compared. If the agent's ultimate goal is to have good relationships with his companions such a preference is probably rational. If agent's ultimate goal is to increase his short-term profit such a preference is probably irrational. We can further ask which of these two goals are rational: and again we would need to know the other levels of goals/values etc.

In order to get the discussion closer to a practical managerial topic consider a situation in which a manager of a large multinational company has to decide about continuing or not continuing an underperforming research project which is significant for his sub-unit but rather insignificant for the whole company. While it may be rational for him to stop the project as he may be evaluated based on the return on investment calculated based on the current data, his superior may be less prone to closing the project as he can see the links of the project to other projects he is responsible for (which may be expressed e.g. in the share of fixed costs). And the way the company's CEO evaluates the project can be even more different: his criteria may be more focused on cultural impacts the project may have on the research and development staff. Quite similar situation is mentioned in the interview with Jeffrey Immelt: "Do you mean that CEO's point of view on a project like this would be different from, say, a business unit head's point of view? Why would that be true? – I have the biggest risk profile and the broadest time horizon in the company. So looking at the evolution of the hybrid locomotive, we're talking about tens of millions of dollars. For the program manager, it's huge, the most massive thing he's ever managed. For John Dineen, who runs the rail business, it's pretty big. For me, you know, it's OK. We can do it." (Immelt, 2006, p. 9)

3.4 The aspects of hierarchy

In order to elaborate more on the concept of hierarchical rationality let us discuss some of the aspects which may be used for constituting its levels.

These aspects are such which, within the realm of practical management, can alter assessment of particular behaviour. Here we can propose at least the following four:

1. Time frame – obviously an action which seems to be rational in terms of profit increase in a short term (say a quarter) may be found irrational in the long term (more than several years). A good example is to stop of investments in renewal of production capacities.

2. Organization levels / units – this aspect is represented especially by vertical dimension of an organization even though horizontal dimension may also play a significant role. Quite often subordinate employees or units complain of irrationality of orders of the superior unit. But when they get familiar with the motivation (i.e. goals and values) of the superior unit they eventually find it rational (even though they still consider it a burden for them).

3. Levels of values – one could, based on generally accepted value context, design a hierarchy of values. He may then conclude that what may seem rational from the lower level point of view (e.g. represented by short-term economic profit) may be found irrational from the higher level point of view (e.g. represented by quite abstract general justice).

4. Extent of possessed knowledge – the more knowledge one possesses the more aspects of a certain action one can (we can assume) assess. Therefore we can conclude that the assessment of rationality will differ among evaluators possessing different level of knowledge.

3.5 Some concluding comments concerning the concept of hierarchical rationality

There are several noteworthy comments to the hierarchical rationality concept:

1. The above stated list of aspect is not complete. The main motivation for this list was to show that the levels of rationality (assessment) are not abstract but rather something that we meet in everyday life. The list also shows that, to quote Kelly: "(...) we are unlikely to be spared the far messier and more difficult task of arguing about the value of competing ends, or about the worth of different goals." (Kelly, 2004, p. 81) Yet it also seems clear that the concept of hierarchy can help us to make this task a little bit less "messy".

2. The concept turns attention from logical or formal aspect of rationality (i.e. we judge rationality of certain decision making by checking logicality of reasoning) towards its value aspect which Spohn mentions in an interesting example: "In planning a holiday trip, to use a trivial example, we evaluate the alternative destinations with respect to their probable satisfaction of the basic values for holidays, and this evaluation of destinations enters itself into the evaluation of specific alternative holiday plans." (Spohn, 2002, p. 250).

3. The concept interestingly connects the notion of reference rationality and external rationality as defined by Morell (Morell, 2006): "Every decision takes place in an environment of certain rationality, which is a set of judgments and beliefs shared by a community of persons which take part in the decision making and follow it. This is what I call reference rationality (…). By outer rationality I call every different rationality which is external to such a community, for instance rationality of an observer who is governed by a different set of judgments and beliefs. (…) Decision is thus irrational only within the rationality

which has been used for making such a decision (reference rationality).” (ibid, p. 39).

4. No matter how we define the various levels of rationality, we should keep in mind that it only makes sense to assess rationality of certain action if and only if it has been based on certain conscious activity. Etzioni (Etzioni, 1988, p. 153) maintains that rationality is connected with cognitive work, development of personality, organizational, and social foundations, and combining maintenance of the appropriate resources, procedures, and institutions with adaptation. What hierarchical rationality brings to this view (which I agree with) is that evaluating certain activity as rational compared to the superior level is rather not enough but that the qualities of rationality as stated by Etzioni above should be also assessed on various levels. In other words the conscious activity should take place on all levels of particular rationality hierarchy. This quality of consciousness will be applied in the following chapter.

4 Implications for practical management

Understanding and using the concept of hierarchical rationality may bring several impulses for the development of both theoretical and practical management.

1. Consciousness of higher levels of goals. Organizations (and especially companies, i.e. organizations focused on profit creation) are usually good in pursuing its primary goals. Where they may fail is better understanding of what is behind (or above) these goals. In other words they may lack awareness of to which goals they should turn when the primary goals endanger their further existence.

2. Conscious understanding of development of goals. One of the dangers encountered when dealing with goals setting and changing environment is rationalization of changes to our goals – an observation made by Gilbert Harman and described by Kelly: “Harman observes that, so strong is our desire to see our own past efforts play a role in bringing about valuable ends, we will often adopt new ends, carefully tailored, so that our past efforts can be seen as instrumentally valuable means to the achievement of these end.” (Kelly, 2004, p. 75) Hierarchical rationalization, used as an analytical tool pointing to various aspects based on which it can be established, can help to better understand why goals are changing. When the hierarchy of goals and related rationalities is established one can easily decide whether changing a goal is still in line with the superior rationality or it is just an attempt to rationalize our past failures. This way hierarchical rationality introduces more rigour in evaluation of changing goals.

3. Improved (especially strategic) management. Unclear or insufficient understanding of one’s goals may result in being prone to imperfect pursuing of one goal when partially pursuing a conflicting one. Better understanding of one’s superior goals and rationality may decrease this risk. To illustrate this issue consider the following example: “Often, individuals and nations, being neither pure expected utility maximizers nor pure honorer of sunk costs, suffer greatly from giving some weight to both in their decision-making. Again, the Vietnam example is instructive. Because we as Americans give some weight to sunk costs in deciding upon a policy (...), we stay in considerably longer than we would have otherwise and thus incur much greater costs than if we were pure expected utility maximizers. On the other hand, because we give a great deal of weight to expected utility (...), and the Communists know this, we receive none of the benefits which we might enjoy from the reputation-effects of being sunk costs honorers. Thus, the particular mixture of weight given tot considerations of expected utility and to sunk costs might result in peculiarly bad policies).” (Kelly, 2004, p. 69)

4. Improved performance management. Once the hierarchical rationality – as an explicit, complex set of goals, values, and meanings – is established it is easier to design a functional performance management system. What sometimes represent a problem with performance management within an organization are clashes between various parts of organization, both in the horizontal and vertical dimension. Where hierarchical rationality can play a significant role is thorough analysis of its aspect - time frame, extent of possessed knowledge etc.

5 Open questions and possible research

Only some aspect of the hierarchical rationality concept has been proposed in this paper. Quite many questions remain open, let me name just a few:

1. The set of aspects based on which a hierarchy of rationality can be designed is definitely not exhaustive. It is needed to analyse this set in more detail. The goal to be pursued is to find a collectively exhaustive and mutually exclusive set of aspect, or such a set for certain context or situation (e.g. a publicly listed company).

2. It is unclear where the formal or procedural rationality should be placed within a hierarchy of rationality: is it on top, in the bottom or is it a general quality which runs (or should run) through all layers of such a hierarchy? I believe we will not be able to provide a final answer to this question yet it should be possible to answer it within a defined context.

3. In reference to Morel’s reference and external rationality it is unclear whether within a certain hierarchy of rationalities the external rationality is included too or it constitutes a parallel hierarchy. Answering this question could help us understand the concept of totally different rationalities as defined by the conflict between the rationality of Western civilization and some primitive tribe (see for example (Wilson, 1970)).

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Primary Paper Section: A

Secondary Paper Section: AA, AE, AH, AN

E-LEARNING AND POSSIBILITIES OF THE IMPROVEMENT OF COMPUTER LITERACY

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The article was created thanks to the support of project of student grant competition at the University of West Bohemia. The project number is SGS-2010-073.

Abstract: Nowadays is computer literacy one of the required condition for employer who wants to success in the labor market. Unfortunately so called necessary minimum of knowledge is not exactly defined. So I present European (ECDL testing) and American (iSkills ICT literacy assessment) concept like the example of dashed definition of computer literacy. Because e-learning is one of the most modern educational process so it is very suitable to use it like the right medium for improvement of computer literacy especially for people who cannot endure classical present teaching. Further I present blended learning which is a learning solution created through a mixture of face-to-face and online learning as the alternative to e-learning. In the end I introduce evaluation and comparison of both educational processes.

Keywords: blended learning, computer literacy, e-learning, European Computer Driving Licence (ECDL), iSkills ICT literacy assessment..

1 Introduction

A necessary condition for successful entry into the current labor market is that the candidate is enough computer literate. But the question is when we can say that a person is computer literate and when not. For everyone that line is somewhere else and unfortunately there is no uniform definition. Simultaneously as technology educator, I am constantly amazed at the rapidly evolving knowledge base that our students arrive with. Therefore is interesting to show European and American conception which could show further developments in this area.

2 Computer literacy

"Computer literacy is a term that has been widely discussed, but whose meaning has rarely been agreed upon [1]." Those words remain as true today as they were when they were first written over a decade ago. The exact origin of the term computer literacy in unclear. Kurshan (1986, cited in Ref. [2]) has reported that computer literacy courses were introduced at many colleges as early as 1965. The term computer literacy was also promoted in the early 1970s by Arthur Luehrmann in an effort to promote understanding of the uses of computers as opposed to the workings of computers. Luehrmann has also coined one of the more concise and pragmatic definitions of computer literacy [Luehrmann (1982), quoted in Ref. 1]: "If you can tell the computer how to do things you want it to, you are computer literate." This definition has the advantage that it admits of a continuum of computer skill levels and it also allows for a concept of computer literacy that is both technology and environment or context dependent. Computer literacy can thus be seen to comprise multiple elements ranging from a spectrum of skills in the use of the computer to broader definitions that attempt to describe the impact of computers on society and the changes in society wrought by the advent of the so-called "information age".

When we would asked how it will look like the definition of computer literacy in the future, we could get inspiration from looking at different European and American conception.

2.1 American conception

Before the actual demonstration of the concept, I would like to point out that presented data come from research report: Setting Standards on the Core and Advanced iSkills™ Assessments by Richard J. Tannenbaum and Irvin R. Katz. This report documents a standard-setting study held July 20–23, 2007, at Educational Testing Service (ETS) in Princeton, New Jersey.

Two foundational levels – one each for the Core iSkills assessment and Advanced iSkills assessment – had been specified previously by the National ICT Literacy Policy Council, a group that was formed by the National Forum on Information Literacy (http://www.infolit.org) and that serves as the certification board for ICT literacy standards. The core foundational level describes the minimum ICT literacy skills a student should have upon entering the first year of postsecondary education. The intermediate foundational level describes the minimum ICT literacy skills a student should have upon entering upper-division post-secondary coursework or entering the workforce. The label *intermediate* was used for the Advanced iSkills assessment because the council believed that the label was a more appropriate description of a foundational level of skill. The two foundational level descriptions were reviewed by a larger community of educators and workforce representatives and suggested revisions were accepted by the council. The council approved foundational level descriptions were key components of the standard-setting process and are shown below.

Core Foundational ICT Literacy Skills
(relevant to Core iSkills assessment)

Demonstrate abilities to define tasks and needs, and to access and manage information in an effective, efficient, and ethical manner through the appropriate selection and application of information and communication technology to succeed in lower division (postsecondary) studies and/or the workplace.

Define: Articulate a need for information as one or more relevant, focused, and manageable questions. Know where to locate and gain understanding of acceptable, common definitions of terms associated with the needed information.

Access: Search, find, and retrieve information from a variety of print and electronic resources (e.g., databases, Internet).

Evaluate: Judge the currency, appropriateness, and adequacy of information and information sources for a specific purpose.

Manage: Conduct a rudimentary and preliminary organization of accessed information for retrieval and future.

Integrate: Extract and combine information from a variety of sources and draw fundamental conclusions.

Create: Summarize and adapt information to describe an event, express an opinion, or support a basic argument, viewpoint, or position.

Communicate: Adapt and present information for a peer audience.

Intermediate Foundational ICT Literacy Skills
(Relevant to Advanced iSkills assessment)

Demonstrate abilities that build on the core foundational skills of ICT literacy (define access, manage, and use information). The learner selects and applies appropriate ICT tools to synthesize, integrate, and assimilate information, to evaluate evidence and infer conclusions, to create and reflect on information processes and products, and to communicate results in a persuasive, ethical, and legal manner. These abilities are demonstrated at a skill level necessary to succeed in 3rd year postsecondary studies and/or the workplace.

Define: Articulate a need for information that defines a hypothesis or problem in operational terms.

Access: Develop and apply a systematic strategy for ethically and legally finding, retrieving, and sorting information from a

variety of relevant sources, representing a wide spectrum of perspectives, acknowledging sources appropriately.

Evaluate: Judge veracity, bias, primacy, persuasiveness, and completeness of information and information sources for a specific purpose.

Manage: Develop and apply a comprehensive system to classify and prioritize information in order to identify and clarify interrelationships.

Integrate: Synthesize information from a variety of sources and perspectives, compare and contrast arguments, identify trends and patterns, and infer conclusions.

Create: Generate information new to the learner through critical review and revision of assimilated information. Develop supported arguments and warranted conclusions to address the task at hand.

Communicate: Communicate information persuasively to meet needs of various audiences through the use of an appropriate medium.

2.2 European conception

While in Europe is testing of computer literacy achieved primarily by ECDL Foundation. ECDL Foundation is the certifying authority of the leading international computer skills certification programme – ECDL / ICDL. The quality and reputation of certification programmes are built on over a decade of experience in successfully delivering Information Communication Technology (ICT) certification programmes to over 9 million people, in 41 languages around the world

ECDL Foundation is a not-for-profit organization that benefits from the unique support of experts from national computer societies and international organizations across the globe. ECDL Foundation has offices in Dublin, Brussels, and Singapore, and appoints national partners (also known as 'operators') around the world to implement its certification programmes at national level. This global delivery network operates under strictly defined quality assurance standards thus achieving consistency of programme implementation around the world [3].

ECDL (ICDL outside Europe), is the international standard in end-user computer skills. The ECDL / ICDL Syllabus consists of 7 modules which define the skills and competencies necessary to be a proficient user of a computer and common computer applications. In order to achieve the ECDL / ICDL certification, individuals must pass a test for each of the 7 modules. ECDL / ICDL Module 1 is a theoretical test of computing knowledge at a general level, while modules 2-7 are predominantly practical skills tests. Individuals who have achieved the ECDL / ICDL certification can successfully demonstrate their competence in the use of a computer and common computer applications.

The ECDL / ICDL Syllabus consists:

Module 1: Concepts of Information and Communication Technology (ICT)

This module enables candidates to gain an understanding of the different parts of a personal computer, as well as some of the key concepts of Information and Communication Technology (ICT), such as those relating to security, and health and safety.

Module 2: Using the Computer and Managing Files

This module requires candidates to demonstrate knowledge and competence in using the common functions of a personal computer and its operating system. It teaches how to adjust the main settings, use the built-in help features and deal with an application that is not responding.

Candidates will learn to operate effectively within the desktop environment and work with desktop icons and windows. This module addresses how to manage and organize files and directories/folders, and how to duplicate, move and delete files and directories/folders, and compress and extract files.

Candidates will learn what a computer virus is and be able to use virus-scanning software. They will demonstrate the ability to use simple editing tools and print management facilities available within the operating system.

Module 3: Word Processing

This module enables candidates to demonstrate the ability to use a word processing application to accomplish everyday tasks associated with creating, formatting and finishing small-sized word processing documents such as letters and other everyday documents.

Candidates will be able to duplicate and move text within and between documents. They gain competence in using some of the features associated with word processing applications such as creating standard tables, using pictures and images within a document, and using mail merge tools.

Module 4: Spreadsheets

This module enables candidates to understand the concept of spreadsheets and to demonstrate the ability to use a spreadsheet application. Candidates will understand and be able to accomplish tasks associated with developing, formatting, modifying and using a spreadsheet of limited scope ready for distribution.

They will also be able to generate and apply standard mathematical and logical formulas using standard formulas and functions, and demonstrate competence in creating and formatting graphs or charts.

Module 5: Using Databases

This module enables candidates to understand some of the main concepts of databases and demonstrate the ability to use a database application. This includes creating and modifying tables, queries, forms and reports, and preparing outputs ready for distribution, as well as learning to relate tables and to retrieve and manipulate information from a database by using query and sort tools.

Module 6: Presentation

This module enables candidates to demonstrate competence in using presentation tools on a computer. Candidates will be able to accomplish tasks such as creating, formatting, modifying and preparing presentations using different slide layouts for display and printed distribution.

They will also learn to duplicate and move text, pictures, images and charts within the presentation and between presentations, as well as be able to accomplish common operations with images, charts and drawn objects and to use various slide show effects.

Module 7: Web Browsing and Communication

This module is divided into two sections. The first section on Web Browsing requires candidates to understand some of the concepts and terms associated with using the Internet, and to appreciate some of the security considerations. In the second section, Communication, candidates will learn to understand some of the concepts of electronic mail (email), and gain the ability to use email software to send and receive messages, and to attach files to mail messages.

2.3 Future trends

If we compare both conceptions, we discover that American conception is primarily focused on work with the Internet and information search. Whereas European conception emphasizes work with office programs. However we may observe common features such as the growing importance of the Internet and electronic communication. This trend is confirmed by a new ECDL Standard 5.0 [4].

3 Possibilities for teaching computer literacy

I can obtain concrete experience from teaching of the courses: The basics of the PC and Introduction to the processing of textual information. Both courses are taught at the Department of computer science and educational technology, Faculty of Education, University of West Bohemia in Pilsen, Czech republic. Teaching of these courses is conducted through e-learning and blended learning. Before I describe practical experience I would like to acquaint readers with the term of e-learning and blended learning.

The American Society for Training and Development (ASTD) defines e-learning as a broad set of applications and processes which include web-based learning, computer-based learning, virtual classrooms, and digital. Much of this is delivered via the Internet, intranets, audio- and videotape, satellite broadcast, interactive TV, and CD-ROM. The definition of e-learning varies depending on the organization and how it is used but basically it is involves electronic means of communication, education, and training [5].

E-learning can potentially provide many important payoffs. To learners, online instruction offers the flexibility and convenience to complete learning units when and where a learner desires [6]. Additionally, online education has been used to reduce costs and to provide an efficient, standardized way to deliver content [7, 8].

In addition to potential cost savings, e-learning has pedagogical potential beyond traditional methods related to the principles of learning discussed. For instance, multimedia capabilities can be used with learning exercises that allow learners to apply concepts realistically [9]. Or, animation can help demonstrate concepts and events difficult to portray in traditional classes, which, in turn, can facilitate a more accurate communication of important ideas [10]. E-learning can deliver “new” information not contained in traditional sources, effectively reinforcing other course information through offering examples, explanations, assessments, and exercises. In this way, online instruction can potentially enhance learning compared to what can be accomplished using a classroom only approach [11].

However, there are also potential disadvantages or limitations of online learning. For example, one study concluded that asynchronous e-learning was not effective as a standalone method to deliver technical training for information technology professionals Learners in the study commented that e-learning eliminates classroom interaction time, where a significant amount of “real learning” takes place as users assimilate information, utilize software, apply knowledge to problem solving, and interact with the instructor and other learners [12].

Other potential problems of e-learning that have been identified in previous research include a sense of learner isolation [13]; learner frustration, anxiety, and confusion [14]; higher student attrition rates [15, 16]; the need for greater discipline, writing skills, and self-motivation; and the need for online users to make a time commitment to learning [17].

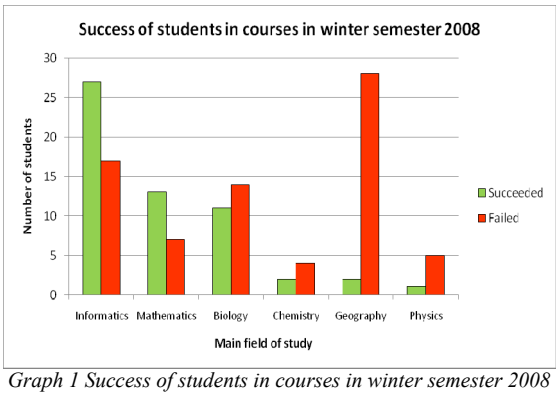
Based on these considerations, some research has stressed the importance of using a “blended learning” approach [18, 19]. Blended learning is a hybrid instructional approach that combines elements of e-learning with the traditional classroom environment [20]. It involves starting with learning objectives and then selecting the best combination of delivery methods to meet those objectives [21]. In some situations, blended learning may involve students completing online units prior to meeting to ensure they share a common foundation of knowledge. This allows class sessions to go into greater depth with application exercises and problem solving. Alternatively, e-learning elements can be used after class meetings to maintain an ongoing dialogue among a community of participants about course-related topics through chats or discussion board postings.

4 Practical experience

How I described above I can build on concrete experiences which I have received from teaching of the courses: The basics of the PC and Introduction to the processing of textual information. Both courses are mainly focused to increase computer literacy among first year students of Bachelor´s degree, Faculty of Education, University of West Bohemia. Specifically, these courses are aimed to teach how to work with MS Word, MS Excel and MS PowerPoint, I would like to point out that teaching is organized according ECDL Syllabus 4.0. Mentioned courses attracted around 250 students so far. Students succeeded in the course if they successfully wrote four practical tests. Students execute tests on school computers and their task was to practical show gained knowledge for example editing of long document in MS Word.

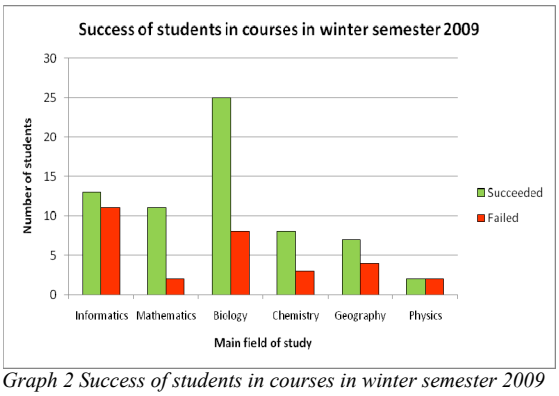
A lot of students met with a form of teaching through e-learning for the first time which can lead to some problems. Among the greatest problem belongs that the students put greater demand on the ability of self-study. For this reason in academic year 2009/2010 we realized teaching of the courses through blended learning. Thanks to this change, we could compare the results of teaching through e-learning and blended learning.

Teaching in the winter semester of the academic year 2008/2009 was using only e-learning. Students could utilize personal consultation with a teacher or a consultation by e-mail during the semester. But it is evident from the graph 1 that for many students were finishing of the courses exacting. Data in the graph 1 are related to main field of study of students and according to the results achieved thus we can infer the level of computer literacy of individual students.



Graph 1 Success of students in courses in winter semester 2008

Because in the winter semester 2009 enrolled less students in courses, we realized lessons through blended learning whereas the required conditions remained retained. With this approach, we eliminate the part of the problem of loneliness of students during the study because they had the opportunity to consult study problems personally at seminars where they were introduced with an additional explanation. Looking at graph 2 shows that this change approved itself because the number of successful students was significantly larger than the number of unsuccessful students.



Graph 2 Success of students in courses in winter semester 2009

5 Conclusion

From accrued experience appears to be very useful introduction of blended learning in teaching. This opinion, confirms especially results of students achieved during the studies and reactions of students in the assessment of teaching quality.

Although e-learning (and various blended approaches that integrate online components into traditional classes) continues to grow rapidly, it still remains at an early stage of development. Consequently, developers and deliverers of online learning need more understanding of how students perceive and react to elements of e-learning (since student perception and attitude is critical to motivation and learning) along with how to apply these approaches most effectively to enhance learning [19].

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Primary Paper Section: A

Secondary Paper Section: AM

LIABILITY FOR DAMAGE CAUSED BY OPERATIONAL ACTIVITIES AND ENVIRONMENT

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Name of grant: Liability in Environmental Law – status quo and perspectives, No P408/11/0339.

Abstract: This contribution is focused on legal liability for damage caused by operational activities. The author deals especially with position of such a liability within the system of liability for damages. The author examines how such legal liability may be employed if damages environment caused by operational activities occur. Moreover, the author analyzes relationship of liability for damage caused by operational activities to liability for environmental damage.

Keywords: environment, damage, environmental damage, operational activities, extraordinarily dangerous operations, liability for damage, liability for environmental damage, proposal of the new Czech Civil Code.

1 General Grounds

Legal liability is one of the most difficult legal concepts and it is a persisting subject of scientific discussions which are important not only for theory, but also for application. This fact also applies to liability for damage, especially liability for damage caused by operational activities, which is *de lege lata* provided in the Sec. 420a of the Czech Civil Code. It is important to mention that this particular provision has been implemented into the Civil Code by the Act No 509/1991 Coll., which altered, amended and modified the Civil Code. The purpose of implementing this provision into the Civil Code may be found in the efforts to create, aside from "subjective" liability, also strict liability for damage caused by operational activities. It is important to emphasize that even before this amendment, strict liability for damage caused by operation was already laid down in the Sec. 432. Nonetheless it applies only to extraordinarily dangerous operational activities. This provision has remained in force and has not been affected by the said amendment. Moreover it should be mentioned that before the amendatory Act No 509/1991 Coll. was passed, the issue of liability for damage caused by operational activities was being dealt with in "economic-legal" laws which regulated relationships between organizations. Last time that this issue was regulated was in the Sec. 145a of the Act No 109/1964 Coll., Economic Code, in which the liability for damage caused by operation of organizations was implemented by the amendatory Act No 103/1990 Coll., having entered into force as of May, 1, 1990.[1]

It is important to pinpoint this development also because of the fact that the then provision of the Sec. 145a of the Economic Code is more or less identical with the actual wording of the Sec. 420a of the Civil Code. Nevertheless, the said Sec. 145a of the Economic Code applied only to organizations. Other feature that should be brought up in respect to the topic of this contribution is that under the Sec. 145a, para 3 of the Economic Code, the liability for damage caused by operation expressly applied also to damage to environment, especially air pollution, water loss, degradation of water, agricultural land or forests including plant stand and damage to or destruction of protected areas and protected species and plants. Aside from stating that it is needed to implement liability for damage caused by operations into the system of legal liability for damage, the explanatory memorandums to any of the abovementioned amendments (the Act No 103/1990 Coll. and the Act No 509/1991 Coll.) do not deal with features of the new provisions.

Today, the issue of strict liability for damage caused by operational activities is becoming more and more important because of the development of the concept of liability for damage to environment which is taking place on both the international and community level and that needs to be considered by the Czech legal order. It is also important with regard to the proposal of the new Civil Code,[2] which will have to deal with liability for damage caused by operational activities.

2 Liability for damage caused by operational activities in the system of liability for damage – status quo and perspectives

Liability for damage caused by operational activities is *de lege lata* provided systematically in part two, chapter six, division two, entitled "general liability". In both the scientific literature[3] and the commentaries to the Civil Code,[4] one may find an idea which I agree with that the position of the essence of this liability within the system of liability for damage is not very clear. Some authors ask whether the lawgivers' objective was to create general concept of strict liability and some authors point out that "given the today's wording of the Sec. 420a, one can hardly regard the Sec. 420a as general in respect to the other cases of operational activities (the Sec. 427 et seq. of the Civil Code – liability for damage caused by operation of means of transportation; the Sec. 432 of the Civil Code – liability for damage caused by extraordinarily dangerous operations)".[5] There is presented in some commentaries to the Civil Code[6] that the Sec. 420a of the Civil Code is of special nature in relation to the general provision of the Sec. 420 of the Civil Code and, further, that the Sec. 427 and 432 of the Civil Code and some other provisions of, for instance, mining or water legislation, etc, are of special nature in relation to the Sec. 420a of the Civil Code.

I do not think that it is important today to analyze in detail the abovementioned issue of the relationship between the Sec. 420a (any operational activity) and the Sec. 432 of the Civil Code (extraordinarily dangerous operations), because as it is known even from practical application, since the Act 509/1991 Coll., by means of which the provision of the Sec. 420a was implemented into the Civil Code, entered into force, the Section 420a of the Civil Code has been followed when raising claims concerning liability for damage caused by operation activities and the provision of liability for damage caused by extraordinarily dangerous operation under the Sec. 432 of the Civil Code is no longer used. This approach is based on rational fundamentals, because one cannot expect that in a situation where liability caused by mere "operational activities" is strict, the injured parties would use the provision of extraordinarily dangerous operation under which they would have to prove that the damage was caused by such an extraordinarily dangerous operation. I think that by using historical-legal interpretation of such provision of the Czech legislation, which concern damage caused by "operational activities", we can get to a conclusion that as a result of the development of sources causing bigger danger, even the regulations had to consider whether one of the presumption of liability for damage would have to be a special feature of dangerousness of the operation or operational activities or not. I incline to the idea that *de lege ferenda* it is more appropriate to consider creating a concept of strict liability

[1] This amendment to the Economic code repealed the governmental ordinance No 40/1963 Coll. on compensation for damage caused by exhalations by socialist agricultural and forest organizations and the governmental decree No 46/1967 Coll. on settlement of damage caused by operational economic activities of socialist organizations to substantial property of other socialist organizations and on remuneration in investment construction and thus liability for damage caused by operational activities was included in statute. For more on the issues of liability under these regulations see: PRUCHOVÁ, I.: *Prevence škod a odpovědnost za škodu způsobenou provozní hospodářskou činností*, UJEP v Brně, spisy právnické fakulty Univerzity J.E.Purkyně, Vol 80, 1988, 116 p.,ISBN 55-989-88 and other works cited in therein.

[2] See especially the Sec. 2866 and 2867 of the proposal of the new Civil Code. Available at: <http://obcanskyzakonik.justice.cz/tinymce-storage/files/Navrh%20obcanskeho%20zakoniku_ver_2010.pdf>.

[3] See: FIALA, J. et al: *Občanské právo hmotné*, Masarykova univerzita a nakladatelství Doplněk, Edice učebnice Právnické fakulty MU v Brně, Vol 191, second edition, 1998 p. 342, ISBN 1081-113-1998(2838- 11/98-17/22).

[4] See: FIALA, J., KINDL, M,. et. al. *Občanský zákoník.Komentář.1. díl., first edition Praha: Wolters Kluwer ČR, a.s., 2009, p. 684 et seq, ISBN 978-80-7357-395-9.*

[5] Compare the work cited in the footnote four.

[6] See: ELIÁŠ, K. et al: *Občanský zákoník – velký akademický komentář, úplný text zákona s komentářem, judikaturou a literaturou podle stavu k 1.4.2008,Vol 1,* Linde Praha a.s., 2008, p. 811, ISBN 978-80-7201-678-7.

for damage caused by operational activities without a need to have a special provision on "extraordinarily dangerous operation". If we compared the today's nature of liability for damage caused by operational activities with the provision on liability for damage caused by extraordinarily dangerous operation, we would have to get to a conclusion that their structure is very similar. Thus, in my opinion, we can agree with the idea that *"in regard to the concept of liability for damage caused by operational activities under the Sec. 420a, the Sec. 432 is no longer needed."*[7]

Therefore it is important to ask whether and how the concept of liability for damage caused by "regular" operations and the concept of liability for damage caused by "extraordinarily dangerous operations" should be structured *de lege ferenda* and whether the eventual features of damage to substantially appropriative environmental components should be expressed directly or in the Civil Code. In this respect it is significant to emphasize that the proposal of the new Civil Code considers two provisions of "compensation for damage" based on strict (objective) principle. To be exact, the Sec. 2866 of the proposal of the new Civil Code,[8] entitled "damage caused by operational activities" says: *"the one who operates an enterprise or other establishment whose purpose is to make profit, shall compensate damage caused by operation, whether it was caused by own operational activity, by a thing thereof or by effects of such activities on surroundings. One can exempt from this obligation, if they prove that they have exerted all care that can be reasonably requested to prevent such damage."* Aside from that there is the Sec. 2867, entitled "damage caused by operation extraordinarily dangerous", which states: *"the one who operates an enterprise or other extraordinarily dangerous establishment shall compensate damage caused by such a source of increased dangerousness; an operation is extraordinarily dangerous if one cannot reasonably and in advance eliminate it. One can exempt from this obligation if they prove that the damage was caused by force majeure, behavior of the injured party or unavoidable behavior of a third party."* Further, the Sec. 2867, para 3 should help us to define what the extraordinarily dangerous operations are: *"it is understood that operations are extraordinarily dangerous it is rendered by factory production or if it involves similarly dangerous substance or if it trades such a substance."* Moreover, in the Sec. 2868, the proposal of the new Civil Code regulates compensation for damage to a real property by stating that: *"the one who even justifiably carries out or provides works, by which damage to real property of other person is caused, or by which possession of a real property is either excluded or made difficult, shall compensate the damage arisen therefrom."* It is important to emphasize that *de lege lata* this issue is essentially regulated by the Sec. 420a, para 2, letter C of the Civil Code, under which the concept of damage caused by operational activities applies if damage is caused by duly justified rendering or providing works, by which a damage to a real property is caused to a third party or if using of such a property is substantially aggravated or eliminated.

In connection with the abovementioned proposal of the new Civil Code and in regard to the need of the Czech legislation to response to the actual problems and trends concerning strict liability for damage in general and in connection to liability for damage to environmental components, I would like to state that a discussion on the proposed wording of the provisions concerning compensation for damage should be still led and the consequences of the new concept should be still considered. In this contribution, I would like to discuss the issue of "damage to environment" caused by operational activities. It has been traditionally and for a long time stated in both the commentaries to the Civil Code[9] and especially in scientific publications focused on the issue of environment law[10] that although the Sec. 420a does not expressly uses the concept of "environment", it is very important in connection with possible negative consequences of operational activities to environment. Especially, the Sec. 420a, para 2, letter B, under which: *"damage is caused by operational activities if it is caused by physical, chemical and biological effects of operation on surroundings."* One can imagine that instead of the term "surroundings", the term "environment" could be used. Because I have concentrated on the issues of environment and the concept of the term environment, I have to emphasize that even from the practical view, the term of "environment" is preferable to completely inexplicit term of "surroundings". Thus I do not regard as unnecessarily needed that there be *de lege ferenda* in the provisions of the Civil Code expressly used the term "environment" in connection with compensation for damage caused by operational activities; this applies to both the general level and any potential amendments to the exemplary list of its components. In particular situations, this could prevent from successful claiming for compensation for damage on the grounds that it was not damage to "environment". This assertion may be supported by the fact that the most frequented cases in which the Sec. 420a is applied, are situations concerning compensation for damage to forest stands caused by immission having its origin in operational activities,[11] which is such a damage that relates to forest as a significant component of environment.

Both *de lege lata* and *de lege ferenda*, it is important to keep in mind that certain features of operating activities and their consequences may be so critical or specific that it will be suitable for them to be provided out of the Civil Code. Ideally of course, in laws concerning the issue in question.

Just for illustration of this thesis, it could be mentioned that one of the traditional examples of such a specific provision is the concept of compensation for damage caused by loss of underground water or substantial reduction of its take-off. Today, we have it regulated by the Sec. 29 of the Act No 254/2001 on Water, as amended.[12] These are the situations in which loss of underground water or substantial reduction of the possibility to take-off such water is in causal connection with operational activities. As for the concept of operational activities, the Act on Water expressly refers to the Sec. 420a of the Civil Code. One of the features of the Act on Water, as compared with the Civil Code, is especially the manner in which damage shall be compensated, as it is based primarily on natural compensation. It should be mentioned that the proposal of the new Civil Code returns back to the priority of natural compensation for damage, which can be assessed as positive, especially in respect to damage to environment.

Mining damage is another special type of damage caused by operational activities. *De lege lata*, it is regulated in the Sec. 36 and 37 of the Act No 44/1988 Coll. on Using Mineral Deposits, as amended. This Act specifies the activities that may cause damage and it also lays down rules for dealing with such damage placing an emphasis on manner and the extend of compensation for damage, for instance, rational costs of preventive measure. The Civil Code shall be used as secondary. One can expect that it would be effectual and convenient to have the features of mining damage regulated by special laws.

[7] See: ŠVESTKA,J., SPÁČIL, J., ŠKÁROVÁ, M., HLMÁK, M. et al. *Občanský zákoník I.,* § 1-459. Komentář. First edition Praha: C.H.Beck, 2008, p. 1111, ISBN 978-80-7400-004-1.

[8] Confer: http://obcanskyzakonik.justice.cz/tinymcestorage/files/Navrh%20obcanskeho%20zakoniku_ver_2010.pdf

[9] See, for instance, the work cited in the footnote No 4, p. 686 and in the footnote 6, p. 811

[10] See: DAMOHORSKÝ, M. *Právní odpovědnost za ztráty na životním prostředí*, Univerzita Karlova v Praze, Nakladatelství Karolinum, 1999, p. 51 et seq., ISBN 80-7841-827-1, KINDL, M., DAVID, O: *Úvod do práva životního prostředí, Vydavatelství a nakladatelství Aleš Čeněk, s.r.o., Plzeň, 2005, p. 200 et seq., ISBN 80-86898-11-3,* STEJSKAL, V.: *Prosazování právní odpovědnosti v ochraně biodiverzity* , nakladatelství Eva Rozkotává-IFEC, Beroun, 2006, p. 187 et seq., ISBN 80-903409-5-4, PEKÁREK, M., PRUCHOVÁ,I., DUDVÁ,J., JANČÁŘOVÁ, I., TKÁČIKOVÁ, J.: *Právo životního prostředí,* I. díl. , second revised edition ,p. 290 et seq., ISBN 978-80-210- 4926-0.

[11] Compare for instance the decision of the Supreme Court of the Czech Republic No 25 Cdo 1016/2004 of February 23, 2005, or the decision of the Supreme Court of the Czech Republic of September 25, 2008 No 25 Cdo 582/2007, or the decision of the Supreme Court of the Czech Republic of February 24, 2005 No 25 Cdo 623/2004.

[12] Similar provisions were already in the previous Water Act No 138/1973 Coll. in the Sec. 29.

Special provisions on liability for damage are further included in the Act No 18/1997 Coll. on Peaceful Usage of Nuclear Energy and Ionizing Radiation (Nuclear Act), as amended and it applies to liability for nuclear damage. The abovementioned provisions of the Civil Code shall only be used if either the Nuclear Act or the Vienna Convention on Civil Liability for Nuclear Damage does not apply. There is no doubt that the features of liability for nuclear damage will be regulated out of the Civil Code and the Civil Code will apply only as a subsidiary law.

The abovementioned facts may be summarized that even as for the future – regardless of which direction the discussion about the new Civil Code will take – strict (objective) liability for damage caused by operational activities will be a part of the Czech legislation. However the question is whether there will be provisions in the Civil Code regulating liability for damage caused by extraordinarily dangerous operations. The proposal of bringing back priority of natural compensation for damage should be appreciated. It is still important to keep in mind that the provisions on liability for damage caused by operational activities included in the Civil Code would allow that special laws could regulate certain issues regarding negative consequences of operational activities differently either with regard to the nature of the harmed subject (water) or with respect to the features of operational activities (mining operations, operating nuclear facility) including implementation of obligations arising out of international treaties or union law by which the Czech Republic is bound.

3 The relationship between liability for damage and liability for liability for environmental damage

One of the most complicated problems is determination of the mutual relationship between liability for damage (proprietary damage to environmental components; the injured party is the entitled one and it may claim its rights through civil litigation) and liability for environmental damage (immaterial reduction of functional qualities of ecosystem or other values of environment; a State is the entitled party; and measures are issued by an administrative body). The goal of this contribution is not to analyze issues regarding environmental damage itself.[13] Nonetheless it can be emphasized that in many cases, certain operational activities may be in causal connection with both damage to property and environmental damage. In other words these two may overlap each other without having to be – and in most cases they will not be – identical. While pondering over effectiveness of liability for damage caused by operational activities, we cannot miss outlining of their mutual relationship.

In the Czech Republic, the situation is even more complicated, for liability for environmental damage is laid down in both the Sec. 27 of the Act No 17/1992 Coll. on Environment, as amended and the Act No 167/2008 Coll. on Preventing Environmental Damage and its Correction, by which the Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage was transposed into the legislation of the Czech Republic. Even the relationship between liability for environmental damage and liability for damage is dealt with differently in the abovementioned laws.

As for liability for environmental damage under the Sec. 27 of the Act 17/1992 Coll. on Environment, as amended, its relationship to liability for damage is that in light of the Sec. 27, para 5, no laws of general nature on liability for damage and on compensation for damage are affected by the provisions on environmental damage. In other words, their relationship is based on the principle of "concurrence". Both the liability for damage and the liability for environmental damage may take place and the fees paid do not count towards. As opposed to this principle, the Sec. 21, para 6 of the Act No 167/2008 Coll. On Prevention of Environmental Damage and Its Correction provides that if a person entitled from somebody else's liability for damage claims its right to be compensated under the general provisions on compensation for damage, the relevant provision on liability for damage will not be used if the damage to property has already been compensated while taking care of the environmental damage under the Act No 167/2008 Coll. Thus "count in" principle, which is considered to be more appropriate, is used.

4 Conclusions

With respect to the abovementioned discussion, it may be asserted that the concept of liability for damage caused by operational activities, as it is laid down in the Sec. 420a of the Civil Code, allows *de lege lata* effective compensation (if we do not consider some problems with figuring out the amount of damage) for the negative consequences caused by operational activities for the property of the injured persons. In light of damage to property that is also by its nature a component of environment, it is problematic that as for the manner of compensating damage, our current legislation is based on priority of monetary compensation. In this respect it, the proposal of the new Civil Code shall be appreciated for its expected return to priority of natural compensation. As regards the character of the operational activities, as a result of which damage may occur, it shall be considered very carefully whether, aside from "general" liability for damage caused by operational activities, it is needed *de lege ferenda* to establish a concept of damage caused by extraordinarily dangerous operations. Even in the future, we should keep in mind that special laws will regulate eventual features of compensation for damage caused by operational activities differently from the Civil Code, especially with respect to the character of the object to which damage is caused or with regard to specificity of certain operations by which they would be caused. These specific regimes will typically (similarly to as it has been done until now) apply even to situations concerning damage to environment.

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[13] For more on environmental damage see: STEJSKAL,V.: VÍCHA, O.: *Zákon o předcházení ekologické újmě a o její nápravě*, s komentářem, souvisejícími předpisy a s úvodem do problematiky ekologicko-právní odpovědnosti, first edition, Praha, Leges, 2009, 336 p., ISBN 978-80-87212-07-3, DAMOHORSKÝ, M. et al: *Právo životního prostředí*, third revised edition Praha: C.H.Beck, 2010, p. 73 et al., PEKÁREK, M., PRUCHOVÁ,I., DUDVÁ,J., JANČÁŘOVÁ, I., TKÁČIKOVÁ, J.: *Právo životního prostředí,* I. díl. , second revised edition, p. 292 et seq., ISBN 978-80-210- 4926-0, RYBÁŘOVÁ, L: *K odpovědnosti za ztráty na životním prostředí v Evropě,in Dávid R., Neckář,J., Sehnalek, D.(Editors) COFOLA 2009, Brno, MU, 2009, ISBN 978-80-210-4821-8,* DAMOHORSKÝ, M. *Právní odpovědnost za ztráty na životním prostředí*, Univerzita Karlova v Praze, Nakladatelství Karolinum, 1999, p. 96 et seq., ISBN 80-7841-827-1, STEJSKAL, V.: *Prosazování právní odpovědnosti v ochraně biodiverzity* , nakladatelství Eva Rozkotává-IFEC, Beroun, 2006, p. 191 et seq., ISBN 80-903409-5-4. KOLEKTIV AUTORU: *Ekologická újma a právní odpovědnost,* Masarykova univerzita, Brno, 1993, 48 p., ISBN 80-210- 0744-3.

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Primary Paper Section: A

Secondary Paper Section: AG

FINDING PARALLELS BETWEEN KNOWLEDGE CREATION AND INVENTORY MANAGEMENT

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This article is supported by Faculty Research Grant of FRI, University of Žilina.

Abstract: According to studies, the total costs related to inventories usually raise to 30-60% of all company's operational costs, therefore it is necessary to manage inventory meaningfully. Inventory management deals with complexity and many coordination problems, because inventory is managed by many different people. This fact usually causes of many problems in company and in supply chain. How is it possible to deal with these complex problems? Company need to improve the learning processes to foster knowledge creation. Studying knowledge management and utilization of these ideas in specific problematic of inventory management can bring competitive advantage for company and whole supply chain. This article contains the Fundamental model of inventory management in knowledge-based company that tries to outline the possible way.

Keywords: knowledge creation, inventory management, supply chain, system approach, coordination problem, complexity, entropy

1 Introduction

We see enormous grow of complexity and interconnectedness. We live in interrelated and networked world. Necessary conditions for any meaningful managing are: better understanding of characteristics of complex systems, grasp theirs behavior in the past and ability to predict behavior in the future. We need to see the whole picture.

Typical case of these ideas is the issue of inventory management. Inventory management cannot be grasped by single person because of high level of complexity. So it is necessary to coordinate the decisions of many employees (from different department across whole organization) and take other stakeholders of supply chain into consideration. The concept of collective intelligence is highlighted in this context. I'm suggested, that the better coordination between each inventory management agents, that is based on better exchange of data, information and also on fostering the knowledge creation can be the only way for company to be successful in competing on global market. For keeping and building the competitive advantage it is necessary to deliver the right product, in the right volume and the quality to the right place in right time. And this is big challenge of logistics. We must try to identify the possible utilization of knowledge creation theory in this specific issue.

2 Knowledge creation theory and coordination ability

The meaning of the expression "knowledge creation" is often ambiguous. It is possible to find different definitions, what knowledge and knowledge creation is. Philosophers view knowledge in broad context. They usually connect term knowledge to wisdom and to understanding universal metaphysical principles.

Other example is case of theoretical informatics experts. They view knowledge creation as finding higher level information (some kind of meta-information) in information or data. It is usually achieved by utilization of some data mining technologies, neural networks and probabilistic proof systems and artificial intelligence. For example, very common is zero-knowledge proofs, which are of great theoretical and practical interest especially in cryptography. Many of these practical problems belong to NP-complete or NP-hard and efficient computation is associated with deterministic polynomial-time algorithms.

From managerial point of view is knowledge created and utilized by mind of knowers. So it is important the human dimension of problematic, not the technology as in theoretical informatics. But what can be utilized in daily dealing with practical problems of company? Many economist and thinkers note, that knowledge is the most important resource of each company.

Nowadays there are many universal models in knowledge management, which should be useful for praxis. But they are often more theoretical and abstract than ready for application in concrete case. The situation is not even in utilization in inventory management. It can be found many universal models of knowledge creation in contemporary literature. For example:

- DIKW model (Data-information-knowledge-wisdom pyramid model),
- Senge's Learning organization,
- Nonaka's SECI model, 'Ba' concept and Process model of the knowledge-based firm,
- Motycka's Theory of regress ARME spiral,
- Rona's and Haslet's Feedback model of knowledge-creation for organizational learning,
- Schwartz's Layer model of knowledge management,
- Monyx's Core theory of success,
- etc.

Each model can be modified and then can be utilized the ideas of knowledge management theories in solving real problems. For purpose of this article, it is utilized DIKW model, ideas of Nonaka and Zeleny. All these models adopt the *system discipline* paradigm and the understanding requires a *holistic approach*.

DIKW pyramid model tries to create distinctions between concepts: data, information, knowledge and wisdom. This model interconnects these concepts, draws connections and highlights the qualitative difference between these concepts.

Senge describes in his book "The art and practice of the learning organization" [7] the main ideas about Learning organization concept and its elements. These ideas are very useful in knowledge creation theory and praxis. Many managers and academics are influenced by his ideas. Senge describes the importance of system thinking and ability to perceive the system dynamics. His learning organization concept has five main characteristics (or areas): (i) systems thinking, (ii) personal mastery, (iii) mental models, (iv) shared vision, and (v) team learning.

Nonaka define knowledge creation as "social process of validating truth" [6]. This idea refers to effort to finding more relevant explanation of reality and the need of improving dialogue ability of participants. From this point of view, knowledge creation can be characterized as communication problematic. Without improvement of the ability to exchange relevant data, information and knowledge, the performance of knowledge creating process will be minimal.

Zeleny [8] defines knowledge in following way: "knowledge is an embodied complex of action enabling structures, externalized through a purposeful coordination of requisite activities". He adds that "*knowledge is purposeful coordination of action*".

These definitions refer not only to action itself, but also to potential action. The need of coordination is apparent in his ideas.

Coordination function can be considered as *one of key functions of management*, because of "business and/or organizational models are based on two core concepts: specialization and coordination" [3]. Kraus and Streeter characterize coordination as "integration or linking together of different parts of an organization to accomplish a collective set of tasks" [10]. He says that coordination tries to achieve common and explicitly recognized goals of company by integration of different parts of company. It is possible to add to this definition also the term 'supply chain'. These ideas can be fully utilized in field of inventory management.

Someone can say that the coordination can be fostered only by better utilization of contemporary technologies and investment in infrastructure. It is not so true, because all managers may pay attention to focus on knowledge creation and improving skills of employees. These activities are investment to (not so far) future and have potential to bring enormous value to company. *The ability to create new knowledge and developing the own company culture is the main competitive advantage of each company.*

3 Inventory management and need for coordination

What is inventory? Kral says, that "Inventory is any idle resource held for future use." [4] The term 'inventory' contains usually raw materials, work-in-progress goods and finished goods; and they are maintained for many purposes. Johnsons [2] enumerates following possible purposes: (i) resale to others, (ii) use in a further manufacturing or assembling process, (iii) investment, (iv) or for the operation or maintenance of existing equipment.

Inventory is current assets and "because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company's shareholders/owners" [12].

Effective inventory management is crucial for fulfilment of customer's needs. According to Kral [4] each manufacturing and production company deal with inventory planning and control. So each company must have some type of inventory management. Inventory is one of the main sources of cost, so the effectiveness of inventory management is of crucial importance to company performance.

Inventory management is a part of logistics. According to Council of Logistics Management can be the logistics [9] characterized as: "Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements." This definition contains term a 'supply chain', that indicates the need for taking these problematic in wider consideration. This task is very complex, because it requires managing flows of goods, services and related information. Many employees participate on solving these tasks and all these *logistics operations must be coordinated.*

Company must usually deals with hundred thousand of stock keeping units (SKUs) and they are located on tens or hundreds of places. Inventories are purchased from hundreds of suppliers. Continuously there are take place transactions (operations), which are closely related to inventories. These *transactions* are held in space and time, and they *are a source of most important data and information for inventory management* (both decision-making and problem-solving).

Managing of inventory (not only on operational level) belongs to NP-complete or NP-hard problems. The classical optimization methods (Operations research, Queuing theory etc.) have low utilization in practice. It is usually caused by:

- the high level of complexity of reality and the models are not able to factor all significant variables (the character of more of them is qualitative);
- it is impossible to take in to consideration the broader consequences of the decision to organization and supply chain;
- the agents utilize also the tacit knowledge.

For these reasons, many companies try to use simplify the processes. Visualization, standardization, implementation of kaizen principles come to consideration in improvement the inventory management. This way is usually not considered as 'scientific', but the results of many companies are astonishing (Toyota, Honda, Motorola).

4 Fundamental model of inventory management in knowledge-based company

The model is based on the structure of DIKM pyramid model; and is influenced by Nonaka's ideas, Senge's concept of Learning organization and PDCA cycle (in this model a cycle means a spiral). Fundamental character of the model allows to articulating the qualitative distinction between its elements. Model shows also the degree of concreteness/abstractness.

Fundamental model of inventory management in knowledge-based company can be seen in the figure 1. The hierarchy of the model represents the influence of higher level to the lower. In other words it means, that each level determine all stages below it. Each change of content must trigger the cascade of changes on lower levels.

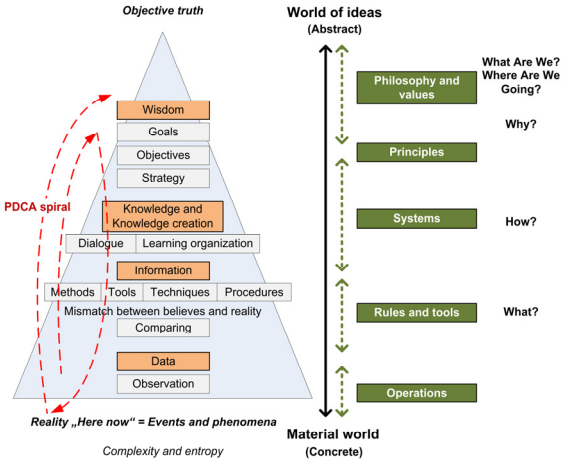

Figure 1 *Fundamental model of inventory management in knowledge-based company*

The cornerstone of this model is the idea that each *company should tries to become wise*. Only then is company fully capable to define mission, key values and orientation on it, manage itself, drive one's continuous adaptation processes (like in the nature) and *improving own business, process architecture and organizational culture.* Only unique and meaningful business process architecture and culture, those are based on real wisdom of a company, can be the main source of long-term competitive advantage. Because it is very hard to copy or transfer to other company.

Many companies are trying to follow some paradigm in management. For example: Toyota production system, Production system Bata etc. They implement unthinkingly many elements of different production systems without understanding of the philosophical background and wider relationships. It brings only minimal benefit or its ends usually with restoring processes to its previous state. Each implementation of a foreign concept may case in encroachment of inner companies climate.

I am convinced that it is possible to build the own business process architecture and company culture, that is based on its specifics and abilities of a company to bring higher value to customers.

4.1 Top level of the model – Wisdom

In earlier 80's and 90's there was information age. Today we live (or we believe that we live) in 'knowledge society'. Companies try to follow the world class companies and managers use terms like knowledge and knowledge creation processes more frequently[1]. But it must be highlights the top of the DIKW pyramid – the wisdom. It is wisdom of a company not only of a few isolated individuals. According to Zeleny [8], "as companies are becoming more informing more informed and

[1] But they usually do not know what it really means.

more knowledgeable, they – the best ones – are searching to become wise".

Generally speaking, wisdom deals with aesthetic question – about purpose of existence. These questions are not cliché, but the finding answers influence the fundamental orientation of company.

Wisdom is strongly *related to ethics* and *values hierarchy* (of individuals, company and society). Zeleny [8] deals with problematic of wisdom of company and he highlights fact that this character of wisdom will bring additional dimension to business. The importance will be attaches not only to efficiency but also to moral (or virtuous) dimension of business. He adds that "wisdom is socially accepted or experience-validated *explication of purpose*."

Wisdom is not some philosophical, academic or fictitious construct. It is real concept and also may have positive pragmatic consequences for company. Wisdom tries to grasp the objective truth and it is the higher level of knowing and human thinking. The finding of truth is the ideal and its may implies the proper way for company.

Only the wise person is capable to identify and define the company goals. Goals imply the objectives, which must be specific, measurable, attainable, realistic and time-targeted. Company must establish a proper strategy to achieve these objectives. Nonaka [6] writes similar idea: "When one relentlessly *pursues excellence*[2] *as way of life, one's knowledge becomes wisdom*".

What can be concluded from these ideas to inventory management? It is possible to find some implications. It can be seen on following table.

Tab. 1 *The upper stages of the Fundamental model of inventory management in knowledge-based company*

Category	*Description*
Wisdom	must be based on providing common good to society; it is related to specifics of business;
Goals	is to achieve the deal; is to fulfill customer needs, because primary function of inventory is to serve the customer;
Objectives	is to deliver the right product, in right volume and quality to the right place in right time; (all activities must considers the phenomenon of volatility between supply and demand of internal or external customer)
Strategy (or Operations strategy)	is on essence about orientation to *low costs*, or *high sales*.

Each of these two ways of choosing the suitable operations strategy offers additional possibilities, which can be seen in the following table. The decision making must always take existence of *principles* into consideration. Character of principles is more long-term than rules.

Tab. 2 *Operational strategy dilemma of company [1]*

1st step	*2nd step*	*3rd step*	*result*
Way of low costs	Low units costs	High throughput	Less variability
		High utilization	
		Low inventory	Short cycle time
Way of high sales	Product quality	-	
	High customer service	Fast response	Low utilization
			High inventory
		Many products	More variability

It is not possible to provide more detailed description of these alternatives, because of length and the focus of this article.

4.2 Knowledge and knowledge creation

Objectives, operational strategy and knowledge creation can be classified as *systems*. Each company should have its own unique system that is based on specific potential and culture of the company. System can be defined as know-*how*.

Operation strategy drives knowledge creation processes. It delimits the modus operandi and creates demand of knowledge. One of key condition for successful knowledge creation is that the knowledge must be demanded by managers of company.

Dialogue and concept of learning organization can be considered as the pillars of successful knowledge creation. Both allow to better understand the broader implications of information. Each company needs to foster its learning processes.

4.3 Information

Required knowledge determines the quantitative and qualitative characteristics of information. Zeleny [8] says: "information a symbolic description of action". In presented model is this level related to question "What to do". From managerial point of view, it must be defined following information for each process:

- what to do (who, how, when etc.),
- what information is necessary (why!, where, who and when need it etc.),
- who (where and how) creates required information (and also transferred, sorted, processed).

Information deals with methods, tools, techniques and procedures of a company. They can be classified as *rules* and *tools*. Foundation of all these elements must be based on ideas emerged from higher levels of the model. The main idea is to be able to compare observed 'facts' with plan. All identified significant deviations must be utilized by control function by real-time feedback.

4.4 Data

Information arises from data. Data describes simple objective facts in natural or social word (events and phenomena). It mediates connection between humans and reality. Source of data are operations of company. The main feature of reality can be described using two concepts: complexity and entropy.

We can find many of approaches to characterise *complexity*. Generally speaking, complexity is reflection of "a condition of numerous elements in a system and numerous forms of relationships among the elements". Warren Weaver [11] postulates, that "complexity of a particular system is the degree of difficulty in predicting the properties of the system if the properties of the system's parts are given". Ability to understand the essence of object and its behaviour is necessary condition for prediction the future behaviour. System thinking based on system dynamics concept enables to better deal with the complexity of reality (especially of complex live systems - like companies, society, etc.).

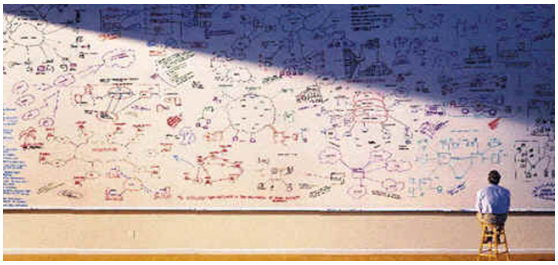

Figure 2 *Consequences of complexity [10]*

[2] It is possible to find many implications (not only in world of business). It is related to value, quality (TQM) etc.

Entropy is the second significant concept that deals with the issue of cognition the reality. Generally speaking, entropy expresses the disorder or randomness of the constituents of a system. Each manager of company must fight against grow of complexity. Grow of complexity is heading for death of all live systems. It is interesting that live systems in the nature are complex adaptive and they are able to keep entropy on low level. We do not know how to do and we must learn it from the nature.

4.5 PDCA cycle

It is important to understand that movement through stages of the model proceeds in a spiral, not a circle. According to Nonaka [6], "knowledge creation is a future-creating activity". The future is always open. Heraclitus (ancient Greek philosopher) says "Ta panta rhei" - everything flows or all is in flux. Everything around us must be seen as a process, because nothing is stable. Similar ideas present Japanese philosophers and they present the idea that human beings also keep changing or becoming.

PDCA (plan–do–check–act, or PDSA: plan–do–study–act) is a famous model that was invented by Deming. This model describes iterative four-step problem-solving process and it implied process of knowing. Necessary condition for process of knowing is the existence of continuous (or never ending) rotation through PDCA model.

PDCA cycle introduce to this model the dynamics and provide better connection between constituent elements; and allow to foster adaptation and continuous improvement process of company.

5 Conclusion

Each company deals with complex coordination problems. All those problems cause in grow of costs and also influence the value added to customer. One of the most complex issue is inventory management. Each company need to improve all processes. But, how to do? Knowledge management is one of the fastest growing disciplines of contemporary management. We must find how to adopt the universal models and approaches into specific problematic of inventory management. Inventory management and knowledge creation has many clues (system character, holistic approach to company, low-structured and complex problems etc.) that makes possible to create theory based on conclusions of these problematic.

This article contains the Fundamental model of inventory management in knowledge-based company model that tries to outline the possible way. Model is based on many partial concepts and models, and shows the conceptualistic or integrated view on target problematic. The main idea is that the ability to create new knowledge and developing the own company culture is the main competitive advantage of each company. It is possible only by improving/fostering the learning and knowledge creating processes of company.

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Primary Paper Section: A

Secondary Paper Section: AE, AH, BC, IN

BANK´S LOANS AND THEIR DETERMINANTS

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The information in this document originates from a concept No. 201011110018 "The Financing of Small and Medium Businesses & The Roles of European Union Funds", provided by the Internal Grant Agency (IGA).

Abstract: Bank loans belong among important sources of financing the enterprise. The credit offerings in the Czech Republic have undergone their characteristic development changes since the time of the country's transformation to the market economy in 1989. The development of financing through credit may be divided into several consecutive stages beginning with the year 1990. In this initial stage, the economy was then financed via loans provided by domestic banks and in those times of the emerging capitalism, the demand for them was tremendous. Such frantic growth was however the beginning of the later problems after 1997 within the frame of the banking sector. The next stages connected themselves directly to the initial stage, and despite existing problems, the demand for credit has been on the rise from the long-term point of view. The reasons for such growth may be primarily allocated to the households, which rapidly changed their lifestyles. Among the very important aspects belong the qualitative changes in the configuration of the credit policy, the worldwide growth of economy, and the completed restructuring of the economy. This credit boom had lasted from the beginning of 2001 until 2008, when the banking sector started experiencing the impacts of a financial crisis in the United States.

Keywords: Bank loan, credit, interest rate, entrepreneur, financial resource, transition mechanism.

1 Introduction

The bank loan may be considered as a financial resource granted to the debtor by the creditor. The cost of the bank loan is represented by the level of the interest rate, which is determined by the discount rate, PRIBOR (Prague Interbank Offered Rate), risk level, maturity, and amount of the borrowed capital. The bank loans are primarily provided by commercial banks, the fact of which fulfils their main function as financial providers. The bank loans supply and demand meet with the financial market, where the banking institutions render credit products to the applicants (companies, household consumers, etc.). In addition to the internal factors of the individual banks and the development of the external environment, the volume and structure of the rendered credit depends on the Czech National Bank (central bank of the Czech Republic) via its monetary policy, which is realized through the inflation targeting. The central bank enforces such through the credit channel of the transition mechanism. Mishkin F. S. [1996] states that the efficiency of the credit channel is closely connected to the type of monetary policy, ability of the central bank to affect the short-term interest rates, character of the banking sector, own stability of the relationship between the interest rates and credit aggregates, and many others. Mishkin F. S. [1996] and Bernanke B. and Gertler M. [1995] assign to a key factor the size of the entities entering this process, when much greater influence on the small and mid-sized enterprises is handled by the performed changes and such enterprises not being capable of substituting the loans for the other types of financing, and even any smaller changes affect them significantly. Čechura L. [2004] reminds that such fact is primarily based on the asymmetric information in the process of rendering credit. The asymmetric information means that the economic entities on one side of the market have much better information than the entities on the other side.

2 Methodology

The submitted project deals with the issue of bank loans and with their determinants. The paper delimits the approaches of selected authors and evaluates the development of credit offerings.

The paper is based on the applicable professional literature and studies. The data originate from the Czech National Bank and the Czech Statistical Office. The foundation of the paper is the descriptive method for the obtained data, in comparison with the approaches of the selected authors engaged in the issue at hand.

3 Outcomes

3.1 Role of Bank Loans in Economy

The banking sector belongs to the industries with fast dynamics of their growth. The efficiency and stability of this sector is the foundation stone allowing the economic growth. Nevertheless, the relationship of the banking sector and other spheres is closely connected. The developed economy needs the advanced banking system and vice versa ([Revenda Z. [1999]). From the analysis of Tůma Z. [2005] and Pašaličová R. and Stiller V. [2002], which compares the credit offerings with the level of the growth domestic product achieved, it is evident that the sector of banking services is very important for the economy of the Czech Republic and significantly affects its future state. Due to rehabilitation of the commercial banks performed after the banking crisis in 1997, the Czech Republic banking sector is now considered as being highly stable. This characteristic emerged fully under the financial crisis during 2008 and 2009. As mentioned above, the credit offerings are affected by the approaches of the central bank, which realizes them through the transition mechanism. Arlt J., et al. [1998] describes the transition mechanism of monetary policy as a chain of economic ties, which allow the changes in configuration of monetary-political tools to result in undesirable changes in inflation, or alternatively in desirable changes of the growth domestic product and employment rates. This transition is however possible only under the adequate reaction of the commercial banks, which may not be always realized.

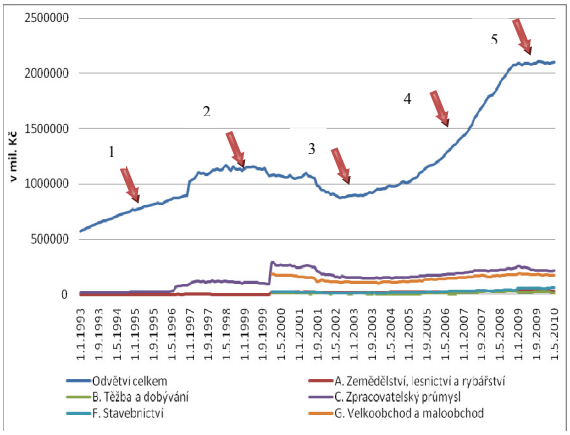
According to Kalouda F. [2009], the bank loans are rated as traditional financial resources. These are the foreign resources, which are characterized by high flexibility and relatively easy process of their obtaining. Because the state tries to support the economy, the process of developing the alternative financial resources continues, especially of their new types (more details by Dvořák I. and Procházka P. [1998]). In spite of these facts, the bank loans remain the important tool in the management of entrepreneurial finances.

3.2 Determinants of Credit offerings

The determinants of credit offerings represent the key factors that determine both, the supply side (i.e. financial institutions), and the demand side (i.e. entrepreneurs). There is no possibility to summarize these determinants easily, but it is necessary to assign them into the context of the market situation, out of which their effects and power result.

The financing through the bank loans had undergone its specific development from the historical point of view in the Czech Republic. Many authors, headed by Buchtíková A. [1999] and Pašaličová R. and Stiller V. [2002], sectionalize this development into several stages. The graph below depicts the development from the beginning of 1993 until the middle of 2010 for all industries and for the selected sub-industries, according to the availability of the pertinent data.

Development of Credit offerings in Companies and Industry (1993 – 2010)[Millions of CZK]



LEGEND:

Odvětví celkem	=>	Industry Total
A. Zemědělství, lesnictví a rybářství	=>	A. Agriculture, Forestry and Fishery
B. Těžba a dobývání	=>	B. Mining and Exploitation Resources
C. Zpracovatelský průmysl	=>	C. Processing Industry
F. Stavebnictví	=>	F. Construction
G. Velkoobchod a maloobchod	=>	G. Wholesale and Retail

Source: Czech National Bank

It is evident from the graph above that the dynamics of the development of credit offerings in companies is significant as a whole. The monitored period may be divided into five stages, which had acquired their attributes of characteristic development. The first stage represents the period from 1993 to 1997, which was the time of the initial market economy, privatization and advancement of private enterprise. The problem of the Czech Republic companies was their weak competitiveness given by a low capital. Because of the needs to develop the economy, the companies were seeking options for their financing. The key resource than became the bank loans. Such fact was the result of the impossibility to find the other types of resources and of the very friendly credit policy enforced by commercial banks. It was very easy then to obtain the resources for the development of business activities, which later surfaced with the banking entities. The main determinant of that time was the business policy of the banks and the need for the capital to develop the enterprise.

The second stage represents the period from 1997 to 2001, which was the time of the stagnation of the credit offerings. This was primarily due to the banking crisis in 1997. Hampl M. and Matoušek R. [2000] describe as main factors the existence of collaterals, over-crediting, permanent low efficiency of the company sector, and subsiding transformation of the Czech Republic economy. It is evident that due to the subsequent tightening of credit policy by banks, there happened an attenuation of the rapid growth of the credit offerings, which subsequently resulted in the slowdown of the economy.

The third stage represents the period from 2001 to 2003, when the volume of the granted bank loans dropped down rapidly. This was the result of both, the further tightening of the commercial policy by banks, and the reflection of the worldwide slowdown of economy, which gradually transferred here from the United States. Other factors may be the inflow of foreign capital and the development of alternative methods of financing.

The fourth stage represents the period of prosperity from 2002 to 2008, to wit from the viewpoint of the credit offerings, as well as from the viewpoint of the economy. Overall, the demand for bank loans was being pulled primarily by residential construction, purchases of new equipment, and expansion of productions. Due to the positive development of the economy and its outlook, the credit policy loosened and the confidence in the economy went up. Simultaneously, further development of alternative resources realized, together with the support of new financial tools headed by the venture capital and business angels, which may be assigned a significant role especially from the viewpoint of future development.

The fifth stage represents the period from 2008 to the end of the period being monitored. It was the times connected to the rapid drop of the demand for loans, which was the result of the full-blown financial crisis, which transformed into the worldwide economic slowdown. The financial crisis had started appearing in the United States already in 2007 due to the price bubble at the real estate market and due to the related securities (stocks) with low market value, which were being wrongly considered as high-quality investment instruments.

The subsequent transition into the other countries had a strong impact on the confidence in economy. Today we may say that the economic slowdown, except several reductions in the form of bankruptcies, was the result of the overall loss of confidence. This fact is also visible on the interest rates of the commercial banks, which were increasing them despite the drop in the PRIBOR (Prague Interbank Offered Rate) and the overall efforts of the central bank to shake up the growth of the credit offerings. Nevertheless, the bank loans remain the important and mostly the key resource of financing the enterprise, despite the further development of alternative resources.
It is evident from the text above that the determinants of credit offerings cannot be generalized. From the historical viewpoint, the determinants depend on the current economic and political situation. However, the key factor remains represented by the commercial policy of the banks that fully surfaced exactly during the economic slowdown, by the relatively low capital, by the inadequate options for substitution of the bank loans, and by the experiences of the company managements.

4 Conclusion

From the historical point of view, the bank loans belong to the important financial resources for the companies. This status is given by many factors. The important role in this is played by the central bank, which is fully autonomous and via its actions supports the growth of financing through credit. No less important factor is the status and development of the economic environment in the Czech Republic, which underwent significant changes directed from the traditional financing through credit to the financing using the risk capital, creation of clusters, technological platforms and others, which allow, in addition to the obtainment of financial resources, the transfer of the expertise that improves the quality of the competitiveness of the entire economy in the Czech Republic. The favorite preference of the bank loans may be particularly the result of friendly commercial policy of banks, stable related legislation, flexible options of financing through credit, variety of loan products, and limited possibilities for other types of financing. The entrepreneurs have relatively broad options for selecting the methods of financing; however, such often represent only the specialized resources in the form of additional tools allowing the diversification of risk and improvement of cash flow. These additional tools of financing may be the leasing, forfeiting, factoring, franchising, subsidies, bonds, etc. On the other hand, there is a group of own tools, which are important for the enterprise, but they are dependent only on the capabilities of a company to generate them in advance via its actions. These may be the reserves, write-offs, profits and various forms of funds. From the viewpoint of financing, in addition to the public loan support via easier obtainment and lower interest rates, the current trend is the development of new financial tools headed by the risk capital and business angels. The main benefit of these resources, as opposed to the bank loans, is their emphasis to enter the very risky projects with an option of fast return on investment, with transfer of knowledge, expertise and valuable contacts allowing faster development.

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Primary Paper Section: A

Secondary Paper Section: AH, GA

INTERVENTION STRATEGIES IN DRAMATIC STUDIES

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Research project MSM0021622443 „Special Needs of Pupils in the Context of the Framework Educational Programme for Basic Education“

Abstract: There is a higher risk of behavior disorder development in institutionalized children mainly for pathological reasons, or limited learning opportunities connected to multifactorial dimension of behavior disorder etiology. It is possible to compensate for these disadvantages by targeted intervention in form of drama education. The article presents the output of a research, the subject of which was the creation and verification of the efficiency of intervention strategies methodology with the use of drama education studies to support and strengthen the institutionalized children in order to prevent behavior disorder.

Keywords: Residential education, drama education, intervention, socialization, behavior disorder..

1 Research basis

Our contribution introduces the concept of intervention program methodology research in group of children at risk of behavior disorder development. For three years, we have been working on the intervention program, its methodology and verification, the verification process is still under way. Selected special education students of bachelor or master study program contributed to the process. The aim of the longitudinal research is to create a methodology of coordinated specific prevention and early intervention with the employment of drama education, which would enable the teachers to provide the children at risk of behavior disorder development with abundant opportunities for their academic and social development.

The multifocal theories constitute the research platform; they are built on the concurrence of influence correlation of bio-psycho-social quantities of behavior disorder development. In the intervention program conception, we use the resilience theory, defined as resistance, ability of an individual to cope with stress effectively and manage positive adaptation (Šolcová, 2009). Both of these theories blend in this concept provided that behavior disorder development is influenced not only by *risk factors (stressors)* increasing the possibility of behavior disorder development, but also *protective factors (supportive)* that could limit or even eliminate the influence of the risk factors. The risk factors are undoubtedly a strong tool identifying the probability of problem behavior, but they represent only a half of the equation. The protective factors are the other half. They enter into various interactions in the course of child's life, they show cumulative effects and contribute to increase the resistance and adaptability of an individual (Vojtová, 2010).

The employment of resilience processes, their purposeful adjustment intertwines the intervention process, where we attempt to strengthen the resistance of the target group of children against the risk factors. We extend their scope for coping strategies. The intervention always directly concerns these processes on the individual level. We strengthen the formation of relations and take into consideration not only the needs, self-actualization attempts, biography and the course of life but also the reality of the individual's life. Drama education is one of the ways to fulfill these demands and enables the child to cope with analogical life situations through play and draft experience; it supports its growth in many socially important areas.

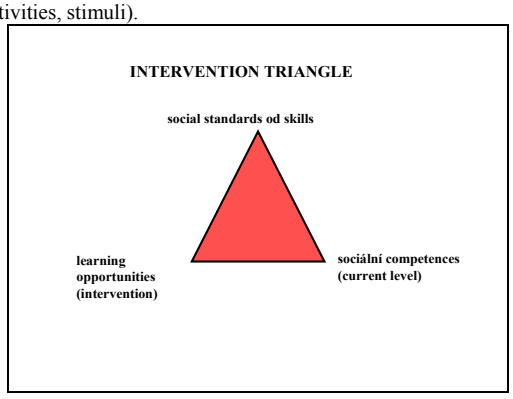
The research target group was children at risk of behavior disorder development or children with disturbed social, and in many cases also personal development. The risk of behavior disorder development is very high in this group. They are children from dysfunctional social background. According to the WHO (ICF, 2001) categorization, they belong into the group of people without impairment, whose problems in functioning and behavior are a direct result of social background (WHO, ICF, 2003). The WHO sees the reason for their problems in insufficient support, discrimination, or stigmatization. These aspects become, mainly in children, potential barriers for successful socialization processes and education and they endanger the future of a child.

1.1 Intervention in form of Drama Education and its Resilience Drive

We aimed the prevention in our program at avoiding the formation of barriers. We try to stop the undesirable trend in the way children behave by intervention and to establish new models of their reactions and behavior (Vojtová, 2010). Drama education offers great conditions for intervention processes adjusted in this way. The merit of drama education in context of prevention and intervention lies mainly in the following attributes:

1. it helps to create an experience,
2. gives an opportunity to independent thinking (group work, every individual is important, has the opportunity to express their ideas, contribute to the whole),
3. it guarantees the freedom to the group (under teacher's sensitive management, the group learns to accept, appreciate and encourage each other.),
4. it provides the opportunity to cooperation (the work on common project, inclusion of so called outsiders),
5. it provides the opportunity to build social awareness (role play, the child becomes someone, understands him/her, decides for the role and him/herself),
6. it comes to emotional release (while solving conflict situations, different problems in expressing emotions, relaxing, releasing the tension),
7. communication, vocabulary is being developed, we work with voice.

The cornerstone for the creation of methodical series is the intervention triangle, that defines the basic starting points of intervention process in children at risk of behavior disorders. These are: social competences (current level of social competences), social standards of skills (aim of the intervention, usual skills in children of the same age) and learning opportunities (particular intervention methods and techniques, activities, stimuli).



1.2 The Aims of Intervention

The aims of intervention were set in two categories according to the needs of the target group. The aims connected with the need to increase the resistance of children to negative influences from their environment were in the first category, the aims directed to development and reinforcement of coping strategies were in the second category. The intervention aims of the first group are directed to reinforce children's ability to cope with stress effectively and manage positive adaptation. They are connected with the search for a way to limit the effect of negative

influences coming from children's social environment.[1] Further, we also focus on children's ability to decide in problem situations. We increase their responsibility for their behavior. The second category consists of aims directed to the formation of child's social relations, to the support of self-actualization tendencies, to the respect for life's reality of an individual, to natural activities, to the skill of analogical life situation management, to the support of development in all socially important situations.

While working with the children, we verified the ***principles*** of support of the intervention efficiency:

Regularity of lessons – children at risk who often live a life of chaos and disarray of events often connected to the feelings of insecurity need a set order, program of a day/week which would give them certain cues in their life, provides them with a feeling of security and at the same time eliminates the stressful fear of future.

Fixed structure of lessons – follows from the same principle as previous point. Fixed order of a lesson makes the work easier not only for the children but also for the lectors. When children get used to settled system, they know what follows, what to expect and they can prepare for the activity. After some period of time, they require "set schedule" themselves and they are very sensitive to every modification. We stuck to fixed structure in our lessons: introduction, warming up activities, introduction into the topic, topic solution, and reflection.

Rules – it was necessary to set rules, which we all agree to stick to. It is advisable to tell the children that we create the rules in order that everybody, including the lector, feels comfortable in the group. While creating the rules, we may not forget the rule of keeping all confidential information, which appears during the lessons, secret. This rule is very important for creation of an intimate and secure atmosphere. All the rules should be agreed to by the group, and possibly confirmed by signatures. When a rule is broken, it is important that the rule-breaker realizes that he has broken a rule. Even when the lesson participants find it hard to keep to the rules, they must respect the set limits.

Number of children in the group – the number of children depends on the age and specific needs of the group. In our case, the ideal number was 6 to 8 children in one group. It is difficult to carry out some group activities using drama education methods at low attendance. On the other hand, it is very difficult to keep the concentration in a large group of children: there is also a higher risk of conflict development among the children and it is demanding for the lector to pay the same attention to every child in the group.

Length of a lesson – speaking from our own experience, the optimum lesson length proved to be 60 minutes. One hour lesson offers enough time to elaborate the topic; it is difficult to keep the concentration and attention of the children in our target group (especially for the individuals with hyperactivity syndrome) for longer time.

Atmosphere – children with many negative experiences from social interactions in various environments often approach new situations and people with distrust and fear. Their negative approach is partly only a defense against possible danger. We therefore try to create secure and familiar atmosphere right from the beginning. The space for open communication is created on the basis of secure atmosphere. The participation on activities is voluntary. We don't force anybody, we just encourage.

Activity – an active approach of the participants is crucial for the success of the intervention. Any change or development progress happens on the basis of lived and felt experience. A passive presence and performing activities without own active approach is no help. But even observation of the activities and passive presence in the lessons can be beneficial for the participant. It happens sometimes that a child is not willing to take part in the activities, yet it is salutary for him/her to be present in the lesson. Often, his/her negative approach is only a transient matter and s/he joins the others after watching them for a while.

Reflection – takes place on two levels (children and lectors) and in different forms (verbal expression, gesture, posture, picture selection etc.) In verbal reflection, we sit in a circle and every participant has a chance to express his/her views on given activities: what s/he felt, what s/he experienced, what s/he liked or disliked what s/he did well and why. We choose the alternative forms of reflection mainly when the attention and concentration of the group is low and we still need to stick to the rites of the lesson and reflect on it at the same time. The reflection of the lectors follows the reflection of the children, it is directed to every individual, and we share what went well, what not and at the same time we point out what can be changed by the child her/himself. In the end, the participants should evaluate each other; we stress the importance of positive evaluation. The final evaluation should give a positive impression to motivate further work.

Lesson structure followed the basic principles recommended by Valenta (1999) and the needs of the group. We maintain the following parts at every meeting: rite[2], warming up activities, introduction to the topic, topic solution, reflection, lesson conclusion, rite.

The topic served as a bearing element of every lecture. Katarina Majzlanova (In. Valenta, 2006) with her list of topics inspired our selection.

1.3 Examples of Activities

Window, a conflict between friends

Aim: To take the responsibility for one's own decisions, deeds
Cognitive: solution of a problem situation, ability to argue
Social: joining the social group
Emotional: empathy development, perception of the other and reaction to him/her, learning to forgive
Age: 10 and above
Time: 50 –60 min
Annotation: The friendship is one of the most important relationships between people. Our life would be empty without friends. A conflict is an ordinary part of our life; it is therefore only natural that it happens also between friends. But how should you behave in a situation when a trusted friend betrays you? The activity makes us think about the term betrayal and what it is connected to.
Progress: Children pair up randomly, by the molecule game, by a cut picture or by counting for instance. They decide who is going to be **A** and who is going to be **B**.
Improvisation assignment: **A** and **B** are best friends, who have just broken a window together. However, **A** is scared of the consequences, the window has to be paid for and s/he is going to have problems at home. When the headmaster investigates the case, s/he denies everything and blames **B**. The improvisation starts at the moment when **B** comes back from the headmaster's office into the class and approaches to **A**.
Improvisation: It is a mass improvisation, everybody starts at once. The lector advises the children to stop when they need and sit down quietly in order not to disturb the others.
Reflection: After the improvisation is over we sit down in a circle. The lector runs the reflection. Example questions: How did it feel to deny the blame? How did it feel to get betrayed? What was the conclusion of your improvisation? Is a situation like this real? Could it happen in real life? Did something like this happen to you? How did you solve the conflict? Could the problem be solved differently? What did the people around you say?

Doctor's waiting room

Aim: Assertive behavior, good manners
Cognitive: solution of a problem situation, ability to argue.

[1] This aim is connected to the situation in the institutional education system, where children return to their families from which they were taken away by legal action after they finish the education.

[2] By **rite** we mean the activity that repeats always in the introduction of our lesson and sets the right mood of the group and enables easier participation in the activities. It is an activity done together by everybody, within the rite, the participants realize that they belong together and their common activity is about to begin. We chose the activity which helps warming up and activation of the group.

Social: communication development, ability to compromise, self-assertion in a social group.
Emotional: empathy development, acceptance of a different view, perception of the other, reaction to him/her
Age: 10 and above
Time: 20 minutes
Annotation: One enters many situations on daily life basis where it is necessary to come to an agreement with people who are both, strange and familiar, to him/her. A play in a pretended situation gives a chance to try "in draft" one's own solutions of the situations without any sanctions.
Props: chairs
Progress:
1) Children create doctor's waiting room by the means of chairs and everybody sits comfortably.
2) Then they draw a piece of paper with character traits of their role on it: occupation, character, illness, how much time s/he has, if he wants to open the window or not. The improvisation starts at the moment when the lector comes in, playing a cleaner, opens the window and leaves. The children start to act in roles.
3) The lector observes the progress of the improvisation; s/he could interrupt in role of a doctor entering the waiting room.
Reflection: Example questions: What was the cause of the conflict? How was it solved? Could it be solved differently? If so how? Have you ever been in a similar situation? What was your solution?
Note: The improvisation from the beginning of the lesson can be repeated after the reflection using the solutions proposed by children.

Summary

In the contribution, we introduced the research concept focused on the creation and verification of intervention programs in a group of children at risk of behavior disorder development. We follow the drama education techniques and methods in formation of the intervention series, because by the means of drama activities, the child can experience the feeling of success and self-assertion, emotional relieve is no longer afraid of new experience, which is the basic condition for further educational action. We present two examples of studies from the intervention program which we have tried and which have had an effective impact on the target group.

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Primary Paper Section: A

Secondary Paper Section: AM

HOUSE OF INNOVATTION – HOLISTIC DIAGNOSTIC APPROACH TO PRACTISES IN INNOVATION MANAGEMENT

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Abstract: Increasing global competition, product life cycle stealing, new scientific findings and demanding customers represent challenges for innovation management. There is no strength as essential as an ability of differentiation by excellent products or services at attractive markets in long-term period. Innovation provides sustainable market success. Therefore, it is one of the key strategic success factors. The purpose of this paper is to present and discuss knowledge and findings of original primary research into South-Moravian companies within two research projects of Internal Grant Agency Faculty of Business and Management Brno University of Technology, which have been conducted in 2009 and 2010. The research projects have been focused on innovation management and its assessment. Author proved with help of questionnaire survey that in many companies an unsuitable model of innovation process management is employed. There is no clearly defined problem description, innovation project management, coordination of activities, communication or cooperation. Vague objectives cause changes in the stages of the innovation process, missed deadlines and increased costs. This finding is not affirmative for our business environment. Therefore, the paper presents solution of this problem which is seen in holistic approach to innovation management developed by A.T. Kearney and called "House of Innovation".

Keywords: innovation, management, assessment, value.

1 Introduction

Innovation is essential for future success, in particular in economies that can no longer compete on cost. Competitive advantage of the Czech Republic has been based on cheap and relatively qualified labour force and on energetic and material-intensive production [5]. However, this competitive advantage is just temporary in global circumstances. As a consequence, western companies, including Czech companies, need to continuously anticipate customer needs, generate attractive ideas, and transfer them into successful products, processes, services and business models. This requires both a systematic management of innovation and the appropriate alignment of the internal organization. Industry leaders are demonstrating day-by-day how to achieve profitable growth by focusing on innovation. Those who have to develop their innovation capabilities will have to develop a proven approach and tools to manage innovation with the aim to maximize effectiveness and efficiency while focusing on the generation of sustainable value.
Only basic innovation management capabilities are no longer sufficient to compete in the globalized business environment. Producers from so called low-cost countries are continually enhancing their ability to create products with high quality and at faster speed. Several well-known players from these economies are becoming a dominant source for certain products and technologies, e.g. electronic components, LCD panels, or whole laptops. In parallel, national investments in their educational systems are resulting in an increasing number of well-educated engineers and scientists in those countries.
Meanwhile, corporations in the western world are losing ground and their innovation performance is not generating the competitive advantages that it once did. Market and technology dynamics are often under-estimated and the necessary speed is lacking even while global innovation dynamics are accelerating. As a consequence of these changes, professional innovation management is becoming an even more important key success factor in achieving higher profitability and superior growth. Companies that have begun to approach innovation management in a more systematic way have achieved significantly higher success rates in terms of transforming ideas into marketable products and realizing successful innovation commercialization.
Companies in industry countries have to be focused on innovation. European Community head competitiveness and sustainable development through the innovation in the focal point. Industry and related services are still driving force for innovation. Their share on GDP is about 37% – with 80% investment in R&D. Never in history of European Community was innovation so important like it is now [7].

2 Primary research results in the field of innovation management

2.1 Research methods and material

Under the auspices of the Internal Grant Agency of the Faculty of Business and Management at Brno University of Technology, a questionnaire survey was conducted in 2010 with a goal to ascertain the on-the-ground situation in the development of innovation management in our companies.
The list of respondents was carefully considered before the start of the project. Options for defining research limits were company size, industry and geographical location in the Czech Republic. After a careful consideration, the decision was taken to conduct research in randomly selected big companies in the South-Moravian Region of the Czech Republic. The research was limited to the South Moravian Region because we believed that it would enhance the informative value of questionnaire surveys. Thus limited research is of much better quality because it allows (in spite of the often-encountered reluctance to complete the questionnaire and to cooperate) to gather data from a large number of companies in the region, which may not have been possible for the whole of the Czech Republic, and individual data would have been much too scattered.

Figure 1 Map of South Moravian Region

A total of 53, mostly production, companies participated in the first research project called *"Research of a level of development of innovation potential, creation, and evaluation of the innovation strategy of medium-sized and large machine-industry companies in the South Moravian Region in the Czech Republic"*. This project uncovered several unfavourable findings on the state of management of innovation activities. Therefore, this area was examined in detail in the second related research project called *"Development of knowledge for improvement of information support of the economic management of company development, in accordance with development of the business environment"* undertaken in 2010. This related and more extensive research took place from February to June 2010. The key was to approach as many respondents as possible and, therefore, to acquire a sufficiently large data scale factor for evaluation of the primary research. The inquiry itself provided quantitative, as well as qualitative data on the current state of the issue in question. When designing the questionnaire, an important factor was to make it simple and relatively brief because that may influence the respondents' willingness to complete it. At that stage, we strived to contact as many South Moravian Region companies as possible. The types of questions used were:

- Multiple choice questions with a single answer,
- Multiple choice questions allowing for several answers,
- Questions with pre-defined answers and a rating score,
- Several questions allowed for completing free text answers.

Question surveys were conducted in two ways. Electronic questionnaires were emailed to respondents. This form of inquiry is very useful because it is easier to both complete and especially evaluate such questionnaires. A small disadvantage is the absence of a personal contact between the interviewer and the respondent which rules out the possibility of seeking additional information or giving explanation if a question was misunderstood. This disadvantage can be eliminated in a subsequent telephone or e-mail conversation. The other type of survey was through a personal contact with higher-level managers, executive officers or company owners in the South Moravian Region. This type of inquiry gives the respondent chance to fully understand the issues addressed, and it also permits a discussion on the given topic, in which often valuable information on issues studied can unexpectedly be encountered. The disadvantage of this approach is that it is very time-consuming.

In view of the objective set for research projects, i.e. *to map and study the current level of innovation management and innovative performance as these issues are reflected in the contemporary Czech and foreign academic literature and in Czech corporate practice* – and the manner of their implementation, scientific methods of work, i.e. logical methods including analysis, synthesis, induction and deduction, were used in the processing of the research.

Analysis was used in the study as a method for obtaining new information and its interpretation. Synthesis is primarily used in making conclusions. Induction was used mainly in generalizing all the findings obtained in questionnaire surveys. Deduction was used to check the dependencies ascertained.

Of a total of 800 respondents contacted during the 2010 questionnaire survey, 750 were contacted electronically and 50 received printed questionnaires during a personal meeting. Companies for the electronic survey were selected from the Technological Profile of the Czech Republic (www.techprofil.cz) database of contact addresses, and the world-wide database Kompass (cz.kompass.com) with its over 34,000 contacts to Czech companies was also used. The guarantee that innovating companies are selected from the database lies in the fact that database search is performed according to user-defined parameters. The selection of companies for personal visits was based on contacts made during our previous project. That provided guarantee that the survey will cover companies actively engaged in innovations that have something to say on the issue. We received a total of 139 correctly completed questionnaires, which represents a 17.4% return rate. Detailed statistics of the 2010 questionnaire survey are in Table 1.

Table 1 Overall statistics of the questionnaire survey 2010

Number of addressed companies	800
a) by e-mail	750
b) by personal visit with printed questionnaire	50
Number of undelivered e-mails	35
Number of partially filled questionnaires	9
Number of completely filled questionnaires	139
Real return	17.4%

2.2 Results of primary research

In South Moravian Region in the Czech Republic, those most engaged in innovations are micro companies (43 %) and small companies (33 %) that have a Czech owner (82 %); of those, 39 % operate on the domestic market within the whole Czech Republic and 27 % operate only on the regional market.

During the last three years, the majority of innovations executed by companies were organization and marketing innovations; however, companies perceive product and process innovations as more important. It generally applies that almost every product innovation should invoke at least one process innovation. When, for example, a company begins to produce a new product, a need for necessary technology that is needed for production of a new product can arise. Such a need can be fulfilled by purchase of new machinery. This is innovation of a production process. In other cases, companies maybe do not even perceive changes executed in relation to product innovations as process innovations. When a company, e.g. as a result of a new product supply, modifies activities of its sales department, in reality it is a process innovation invoked by the initial product innovation. In some cases, even product innovation of a lower intensity invokes subsequent process innovation of a higher intensity.

Results of our questionnaire survey made it possible to identify important failures and gaps in innovation management in our manufacturing companies. Concrete practical conclusions of primary research can be summarized as follows.

- In most cases, innovations are not a company's key process, and more often than not they are based on technology transfer rather than the company's internal research and development.
- Research and development activities start late, take too long and are expensive. This causes time loss and delays in marketing innovations. That in turn negatively impacts profits.
- There is no systematic methodology for the use of a company's innovation potential. Innovations are often confused with methods for a new product development with no relationship to the customer.
- Indifference and unwillingness of owners and top-level managers to take risks even in the case of promising innovations is manifest, and the prioritizing of certainty prevails.
- In companies, insufficient innovation culture predominates, which can of course be traced back to the lack of top management's interest.
- An unsuitable model of innovation process management is employed. There is no clearly defined problem description, innovation project management, coordination of activities, communication or cooperation. Vague objectives cause changes in the stages of the innovation process, missed deadlines and increased costs.
- There is no marketing information system in place for the modelling of future markets or the analysis of customers, their behaviour and unexpressed needs. Such insufficient knowledge of market requirements is a reason for excessively high innovation costs.
- No comprehensive evaluation of innovation benefits is performed. In most cases, evaluation is done on the basis of economic parameters only. This approach relies on successful determination of expected innovation-related revenues, which is very difficult, especially in initial stages of the process when it is not clear what the new product will look like and who its target customers will be.

Methods of solution of such insufficiencies were examined by researching professional literature of prominent Czech, as well as foreign authors and other sources, with the objective to contribute to a flawless, if possible, realization of innovation activities of a company. Such solution is seen in a holistic approach to innovation management developed by A.T. Kearney and called “House of Innovation”. Next chapter is going to present basis and principles of this holistic approach as it is described by A.T. Kearney in its studies.

3 A.T. Kearney's House of Innovation

A.T. Kearney's research has shown that companies with sophisticated innovation management are twice as profitable and grow significantly faster than their competitors with no innovation management system [4].

Innovation does not mean just R&D. Innovation means continuously turning knowledge into "profit" by addressing future customer needs better than the competition. Innovation here can be product, process, service, and/or business model innovation, and is the responsibility of multiple functions and top management, not just the R&D function. Therefore total innovation spending is much higher than just the spending on R&D. Similarly, innovation management does not mean just innovation development. Best practice innovation management begins with innovation strategy and continues through innovation development to management of the entire innovation life cycle. As a result, common innovation management improvement opportunities across industries span from missing innovation strategies to slow innovation development to lacking proactive complexity management in the innovation life cycle.

3.1 Holistic approach to Innovation management

Innovation is the result of a company's efforts to develop new products, new services, new business models or processes in which their customers see a new or additional value added, and for which these customers are willing to pay a price. Hence, innovation is not just an invention. Innovation has to prove its value in the market.

A.T. Kearney's holistic approach addresses all relevant innovation management dimensions. To ensure a steady flow of innovations, companies have to continually and systematically manage them. This includes innovation favouring components such as:

1. An innovation strategy that is aligned with the business strategy,
2. An organization that drives innovation by its structure and culture,
3. A product-life-cycle process that continually develops the capabilities for idea generation, product development, market launch and timely discontinuation of products and services that are no longer profitable,
4. Enabling factors for innovation management with regards to IP, Knowledge, HR, Controlling-and IT Management,
5. Innovation management success with regards to the right key performance indicators to monitor and measure innovativeness.

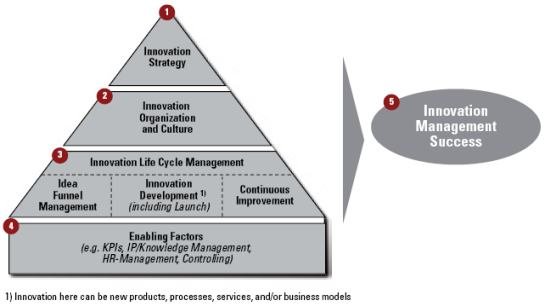

Figure 2 A.T. Kearney's House of Innovation and its four dimensions of innovation management [2]

The success of innovation management can only be made sustainable if these dimensions are addressed at all levels of a company on a continuous basis. Because innovation management covers all aspects fostering the innovation capabilities of a company, all of these components must be managed to secure the company's long-term growth. Therefore, only a holistic view of innovation management can achieve sustainable innovation and growth of a company.

For example, a company that was not fully satisfied with its innovation performance asked A.T. Kearney for an innovation management assessment. The company's current innovation management performance was evaluated and compared to external benchmarks. The gaps identified pointed to the need for improvement in all dimensions of the House of Innovation. A project list was then developed consisting of all required actions, including:

- Define a comprehensive innovation strategy based on understanding of macro trends and customer needs,
- Create a separate New Business Development organization to focus on new technologies and new markets,
- Increase share of new ideas generated by external partners from 5% to 30%,
- Improve innovation development management to sooner stop low-potential projects,
- Create cross-functional teams responsible for both launch and post-launch life cycle management,
- Implement a new portfolio management IT system to automatically track and generate innovation performance KPIs. [3]

Four of these six measures were prioritized based on business impact and ease of implementation. The prioritized measures were then anchored in a roadmap for improving innovation management over the following 15 months.

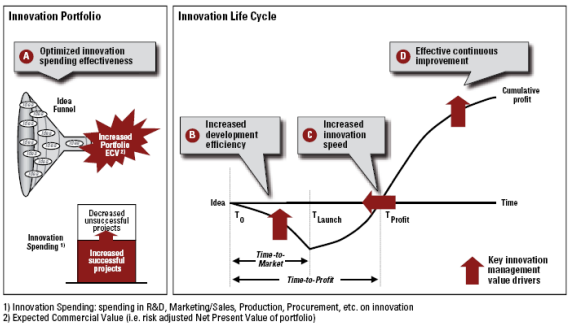

Figure 3 Value impact of improved innovation management [3]

Achieving best practice in all areas of the House of Innovation generates tangible value for a company. This value can be identified and measured in terms of four value levers: Optimized innovation spending effectiveness, increased development efficiency, increased innovation speed and more effective continuous improvement.

A *Optimized innovation spending effectiveness:* Increase the effectiveness of the innovation spending through a defined innovation strategy and by a better funnel management.

B *Increased development efficiency:* Increase the development efficiency through measures such as increasing engineering capacity utilization or innovation globalization in order to minimize unit cost while ensuring required quality levels.

C *Increased innovation speed:* Accelerate the product ramp-up to minimize time-to-profit by optimizing processes and by leveraging an innovation network.

D *Effective continuous improvement:* Achieve continuous improvement with measures such as lean design and complexity management to order to optimize product life cycle profitability.

By systematically achieving best practice in all elements of the House of Innovation and therefore addressing all four innovation management value levers, a company can – even in Western Europe – increase its competitive advantage and profitably grow in spite of pressure from new competitors from emerging markets.

3.2 A.T. Kearney House of Innovation – a diagnostic approach to innovation management measurement

The performance of the Innovation management capability assessment relies on the quality of the diagnostic design. As the A.T. Kearney studies [1], [2], [4] revealed, the challenge is to choose an appropriate diagnostic design so to thoroughly measure innovation management in SMEs. This system has to base on incorporates processes, activities, structures and/or cultural aspects of innovation management. At first glance, these models often seem to coincide, but a closer look reveals that they differ in that they take into account the organizational

pervasiveness of innovation and its socio-technical connectedness. On the one hand, there are specialized approaches to evaluate the detailed performance of certain dimensions, for example, tools based on best practices in new product development that focus on life-cycle related issues. On the other hand, there are systemic approaches that take a holistic view on innovation management but are lacking in thoughtfulness. This group of assessment tools consists of the following three subgroups:

- Technological, new product development and life-cycle management focus,
- Innovation organization, culture and climate focus,
- Systemic and quality-oriented innovation management approaches.

As technological innovation and new product development are well known innovation practices, models are often generated in the context of technology. These assessment tools illustrate core processes and enabling processes relevant to new product development and overlay them with traditional performance measures.

Core processes comprise new concept development, product development, redesigning the production process, redesigning the marketing process, managing knowledge and technology. In addition, cultural aspects are addressed; however, they play minor roles. The advantage of these tools is that they seek to link processes and performance.

Tools with a technological and new product development focus are difficult to transfer to other industry sectors where "soft" innovation (such as service innovation) is dominant. In addition, these tools often do not address organizational and socio-technical dimensions. However, in newer versions, cultural and organizational issues are partly considered.

Secondly, there are other tools that focus on specific dimensions of innovation, including innovation culture, climate and leadership. Critical success factors address aspects such as risk taking behaviour, motivation of employees, entrepreneurial culture, value and norms supporting innovation, and quality of leadership. Although these tools provide valuable insight into the strengths of the company in terms of one dimension, they do not sufficiently take into account strategy or life-cycle related issues. This group of tools takes a systemic and quality-oriented perspective on innovation management.

Holistic and systematic models that address the complete ecosystem of innovation show a significant overlap with the A.T. Kearney House of Innovation. In addition, they are often designed to be applicable to any industry, innovation type, and size of an SME.

Although other system-based models – such as EFQM or the Malcolm Baldrige Award – have been developed over many years and considered robust measurement concepts, innovation is only a small component of these tools. Recently, new tools have emerged that are based on the EFQM quality frameworks of innovation. For example, one self-assessment tool developed by an Irish intermediary assesses the innovation capability of SMEs based on the EFQM quality framework. Although this initiative seeks to set a new standard of innovation capability assessment, the tool has not been adopted on a large scale.

The innovation performance measurement of the organization must take into account all factors influencing the innovation. To cover all these factors holistic A.T. Kearney House of Innovation can be used. It covers all dimensions of innovation management as well as factors supporting innovation management development in the organization. It involves the innovation strategy, innovation organization and culture, innovation life cycle management (including new idea management, product development, launch innovation to market and continuous improvement). A.T. Kearney is holistic in that point that it covers all aspects of innovation management and inter-connects all of its elements. It is clearly focused on value creating and requires performance measures to monitor contribution to organization's value:

1 Innovation strategy – includes whether the organization has or has not innovation strategy, i.e. clear vision, its employees and other stakeholders understanding and communication. This first area of the A.T. Kearney House of Innovation is an edge to define the outcomes and goals to be achieved.
2 Innovation organization and culture – includes soft factors, which significantly contributes to innovation performance. Precondition is openness, communication, information sharing and elimination of barriers.
3 Innovation life cycle management – having good ideas is not enough. in relation to the outcomes is necessary to know and have control over the entirely innovation life cycle, which includes:
    a. Idea funnel management – i.e. systematic collection of new ideas and incentives (both internally and through partners), their classification, evaluation and selection. New innovation projects are executed on their base.
    b. Product and process development – phase in which new ideas are transforming into R&D projects utilizing enabling factors running in particular time period.
    c. Launch and continuous improving – achieved invention outputs should be placed into the market so that is innovation. This addresses the third phase of innovation life cycle management. It includes time-to-market and time-to-profit. Within time-to-market commercialization absorbs R&D costs (time to break-even point). Time-to-profit presents life cycle within it innovation produce a profit.
4 Enabling factors – i.e. human resource management, knowledge management, information share, controlling, project and process management, IT technologies and management etc. All these factors represent driving forces. Top companies have to support appropriate and sufficient quality human resources that can communicate with each other and manage and share information and knowledge. For project implementation, acquisition and utilization of financial and other resources, they must be able to manage projects and have established a controlling system. It could provide effective feedback. Everything has to be supported by information-technology background.
5 Innovation outcomes – are what innovation management and its performance makes visible. Outcomes represent quality, quantity and timeliness of innovation. Outcomes measures capture the way how innovation business model outputs were transferred into a company value.

A.T. Kearney in its study [2] identified key top critical success factors for each dimension of its House of Innovation.

1 Innovation strategy:
    a. Create clear vision for innovation aligned with business strategy,
    b. Spread and communicate it to all hierarchies,
    c. Analyse all environmental trends (e.g. customers, competitors, technologies),
    d. Measure achievements against strategic objectives.
2 Innovation organization and culture:
    a. Provide time, space and money to exploit new ideas,
    b. Support and active involvement from top management,
    c. Built excitement about innovation,
    d. Accept failures and mistakes,
    e. Involve internal and external resources.
3 Innovation life-cycle management:
    a. Create systematic idea generation and innovation processes,

b. Turn lots of new ideas into innovation projects,
c. Built continuous improvement processes,
d. Accelerate time-to-market and time-to-profit.

4 Innovation enablers:
a. Establish incentive systems to support innovation management activities,
b. Ensure sound project management and control of resources,
c. Ensure systematic management of intellectual property resources,
d. Apply appropriate IT tools for innovation management tasks,
e. Integrate lessons learned and knowledge sharing.

The diagnostic designs applied in current practices are not fully balanced and hardly consistent with respect to the indicators applied to measure the performance in each dimension of the A.T. Kearney House of Innovation. In dimensions such as strategy, launch and enabling factors, the analysis revealed room for improvement in the indicators chosen to measure performance in these dimensions. Although these dimensions are rated as highly relevant by the self-assessment tool providers, an analysis of the different self-assessment tools revealed that there is no consistent and comparable measurement approach available. According to the self-assessment tool providers, it is rather difficult to take into account different types of innovations – those ranging from incremental to radical innovations and technological to business model innovations. Existing assessment tools contain only a limited number of indicators that address business model or organizational innovation.
Apparently, there is no standardized framework for comparing the results of innovation management. Thus, with existing practices it is difficult to generate tangible benchmarks of the innovation management performance of SMEs. To set a new standard of innovation management assessment, the following objectives must be achieved:

- Address all dimensions of innovation management in the diagnostic design,
- Close the gaps, specifically in terms of strategy, launch and knowledge management,
- Set a new standard of diagnostic design for excellence in innovation management,
- Integrate the various types of innovation such as organizational and business model that have not yet been fully conceptualized.

3.3 Discussion towards a profound innovation management assessment – measuring the excellence of innovation management and capturing success and business impact

Currently, there is no way to assess both the processes and capabilities of innovation management as well as the business impact. Traditional performance measurement systems, those that focus on quantitative outputs, do not measure the quality of innovation management processes to ensure the successful generation and transformation of ideas and value capture. Here, only input and output measures of innovation management are addressed. Still, there are tools to obtain a better understanding of innovation performance by looking at innovation capability and the processes involved in developing and exploiting innovation. In total, only around 10% to 20% of the indicators in holistic approaches are output indicators that address innovation management success and business impact. In fact, quantitative measures play a minor role.
Indeed, investigating input and output measures only provides a first insight on the current innovation management performance. However, in many cases, traditional output measures are related to R&D activities that do not fully capture the overall output of innovation management processes. Moreover, a purely output-oriented approach is not sufficient to identify the root causes of weaknesses. Therefore, it is crucial not only to investigate the current innovation success but also the processes with which the SME develops and exploits these innovations.
In current assessments of innovation management performance, the business impact of innovation management is not fully captured. Apparently, there is no tool available that fully integrates both innovation management success measures and indicators to analyse root causes of either strong or poor performance. This tool, if available, would provide SMEs and other stakeholder groups with insight into "what" the weaknesses are, "why" they perform strongly or poorly, and which levers need to be improved.
To develop a best practice in innovation management self-assessment, both output-related indicators and root-cause indicators must be combined.[1]

4 Conclusions

The article summarizes the issue of management of innovation activities and findings of empirical research. It strives to show the importance of innovation activities linked to the overall effectiveness and competitiveness of a company as well as prosperity in the presently fading economic crisis and still strong competitive environment. As the old saying goes, “If you can’t measure it, you can’t manage it.” This is especially true for innovation where there is a pressing need to bring focus clarity and discipline to a fundamentally creative process. The holistic approach A.T. Kearney House of Innovation could be used by SME as an innovation activities management and assessment model. Assessment systems are essential for innovation management success. Assessment systems are both fundamental and critical to success with innovation. It is not enough to simply pick several areas, use whatever you happen to measure and expect that to give you the information you need to manage innovation. Group of assessment holistic tools based on A.T. Kearney House of Innovation provides a systematic and quality-oriented view on innovation management.

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Primary Paper Section: A

Secondary Paper Section: AE

[1] For further discussion see Europe INNOVA paper No. 2

STUDENTS WITH ASPERGER SYNDROME AND HIGH-FUNCTIONING AUTISM

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The paper is published within the frame of research MSM 0021622443 (2007 – 2013)

Abstract: This paper focuses on students with Asperger syndrome and High-functioning autism. Their intelligence level is in the average range, they should be educated in mainstream schools although it might not always be easy. The process of integration/inclusion depends on many factors. The social skills of these students are often weak and may cause difficulties in educational settings. Many teachers are not sufficiently prepared to meet the special needs of these students.

Keywords: Asperger syndrome, High-functioning autism, students, education, integration, inclusion.

1 Asperger syndrome and High-functioning autism means special educational needs

Asperger syndrome (AS, also Asperger's syndrome) is one of the autism spectrum disorders (ASD) and belongs to pervasive developmental disorders (PDD). It is a type of autism at the less severe end of that spectrum. It is a developmental disability that influences ***social communication, social interaction and social imagination.*** Disturbances in these three areas are reflected in the learning process of each student in various ways and to varying degrees because Asperger syndrome affects people differently. Students with Asperger syndrome can find it harder to read the social signals that are clear to most people. This means they find it difficult to communicate and interact with other people, which can lead to high levels of anxiety and confusion.

There is also a category called High-functioning autism (HFA). It is often understood to be the same as Asperger syndrome. In my view, these are two different categories. I assume people with Asperger syndrome usually have fewer problems and a higher level of intellectual ability then people with high functioning autism which we can consider a more serious variation and a variation of Childhood autism divided according to functioning in the society. Different authors describe these two categories differently (comp. Asperger, H. 1944, Attwood, T. 1998, 2005, Thorová, K. 2006). The main difference between the two is in language development. The National Autistic Society in Great Britain states that people with Asperger syndrome will not have had delayed language development when younger (The National Autistic Society [online]).

It is necessary to clarify that many people with the above mentioned syndromes lead productive lives. People with Asperger syndrome are often experts in various specialised fields. Some examples are music, history, mathematics, public transport, meteorology, poetry, etc.

1.1 Intelligence of Students with AS and HFA

People with autism also often have learning disabilities and other impairments, while people with Asperger syndrome or High-functioning autism are likely to have the same range of intellectual skills as the general population, though they may have a number of other characteristics that make life difficult for them. Students with AS and HFA manifest average or often above average intelligence but face problems in social lives. It is important to know that the intelligence level in the average range does not mean that people with Asperger syndrome (mainly AS, not HFA) manage their lives perfectely; they are usually seriously disabled in above mentioned social interactions. Some of them even have exceptional abilities, this feature is called savant syndrome. There are excellent works on this feature by Treffert, D. A. (see resources). The normal intellectual skills plus poor social skills can be confusing for their peers and even teachers. They usually have few friends at school and in life. They can be intelligent in an abstract way, as measured by tests, but not in a functional way and may need support in life skills (Powell, A. 2002).

1.2 Social Interactions and Verbal Skills

Another feature of AS is the tendency to stick to inflexible behavioural routines, such as wishing to sit in the same seat at school and becoming upset if they cannot, or always wearing the same clothes, walking the same way, eating the same food, etc. Another feature of this disorder is also egocentrism. They seem to be interested in themselves only. They usually don't find other people interesting enough and keep taking about their own topics. Their general motor activity can also be affected; the individuals are motor clumsy, they have difficulties in sports such as problems learning to ski, skate, ride a bike, etc. People around them often don't understand them, which can lead to a state of depression and even to suicides.

Students with Asperger syndrome often have above average verbal skills, but in some cases the voice appears to be flat and lacking in emotion, speech can be stilted and repetitive, and conversations tend to revolve around the self rather than others (Bazalová, B. 2009, p. 94). It is typical to express themselves in details when they desire to talk only about their field of interest. Consistent truthfulness, shocking remarks, which children or adults may address to unknown people, are characteristic features of Asperger syndrome and are an obstacle for integrating into society.

Students with this syndrome struggle to read social signals or understand jokes, metaphor or sarcasm. This is a great problem because we tend to use metaphors in everyday life. When you ask someone with Asperger, "Could you help me?" you get the answer "Yes" but nothing else. He/she answered your question but did not understand you wanted help from him/her. They simply do not understand the implications of the question.

2 Integration/inclusion versus special schools

Students with Asperger syndrome and High-functioning autism need special support at school as they have special educational needs. For some students with Asperger syndrome, it is optimal to complete compulsory education through individual integration in primary school, for others it is preferable to attend a special school. I would suggest that a special school should be for children with other types of autism spectrum disorder and that we should provide sufficient support in mainstream schools for children with Asperger syndrome or High-functioning autism. Integration is not suitable for every child with a disability and there is not an effort to integrate all children into mainstream schools but I think that students with AS can succeed in regular schools when offered support and proper conditions. Integration does not mean just placing a child with a disability into a regular school. Integration involves many factors, which should be taken into account. A lack of any of them can cause more negative than positive effects in an integrated educational setting (Bazalová, B., Vlčková, R. 2010, p. 103).

According to counselling centres and teachers our research team cooperate with, there is a high increase in students with Asperger syndrome in mainstream primary schools in the Czech Republic (although there were not so many in our research group). We have been focusing on features that affect success of compulsory education of pupils with Asperger syndrome. Social factors play a crucial role as was mentioned above. These students may often be outsiders in a class or within a group of peers as AS students have certain peculiarities in the behaviour. They however intellectually cope with their peers, even often exceed both them and teachers, especially in the area of their interests (mathematics, astrology, time-tables, drawings, etc.).

In some cases, people with Asperger syndrome may not be diagnosed until they reach secondary or higher education. They

may benefit at some universities from having access to someone helping them with their studies. The person will be identified by student support disability staff (e.g. Cambridge, Birmingham, Newcastle, Keele, Masaryk University, Palacky University, etc.) (comp. HEAG project, European Agency for Development in Special Needs Education).

It is necessary to raise awareness of students and teachers of particular needs of the students with Asperger syndrome. Teachers of mainstream school usually don't understand the impact of the disorder upon the thinking of their students and their learning styles. Teachers should consider a range of strategies for enabling participation and access.

2.1 Analysis of Conditions of the Process of Inclusion

We are carrying out research at the Faculty of Education, Masaryk University (*Special Needs of Pupils in the Context of the Framework Educational Programme for Basic Education,* MSM 0021622443, prof. PhDr. Marie Vítková, CSc.). There are several research teams focusing on various topics. Our team focuses on *primary education of pupils with Autism Spectrum Disorders and possibilities for their further educational process and work.*
The following diagram shows the internal and external determinants involved in the integration process of students with Asperger syndrome in primary schools, thus analyzing the factors contributing to the quality of social inclusion of pupils in the context of integrative/inclusive education.

Fig. 1: *Analysis of conditions and effects on the process of inclusion (comp. Vlčková, R. 2010,Bazalová, B., Vlčková, R. 2010)*

Parents' approach and family environment of a child with AS is very important in the process of integration/inclusion. Parents-school cooperation significantly affects this process. Some parental attitudes may hinder or even jeopardize it.

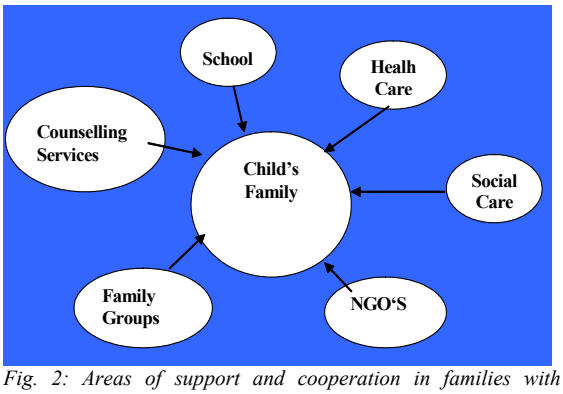

Fig. 2: Areas of support and cooperation in families with children with AS (Vlčková, R. 2010)

It is possible to conclude from our observations of integration process that there are four main factors that play a role in the process of integrating pupils with special educational needs (SEN) into mainstream school in the South Moravian Region. These are:

- Positive attitudes of regional offices towards integration/inclusion of students with SEN.
- Financial support of integration/inclusion by regional offices.
- Schools willing to integrate students with SEN.
- Counselling services for pupils, schools, and parents.

There are some factors that make integration difficult in mainstream primary schools we were observing. These are:

- Insufficient information for teachers and assistant teachers about specifics of Asperger syndrome.
- Lack of financial support.
- Not enough counselling centres (the number of students with autism spectrum disorders is rapidly growing according to our findings).
- Lack of support for families in the area of family therapy.
- Lack of social skills training for students with Asperger syndrome and autism spectrum disorders.
- In the whole country, there is insufficient cooperation among various agencies (school, health care, social care, etc.).
- Not enough personal assistants for time after school outside of urban areas.

3 Research in parents of children with autism spectrum disorders

The research sample consisted of 237 parents of children with autism spectrum disorders, 234 from the Czech Republic and 3 families from the Slovak Republic. Our aim was to analyse the process of diagnosis of children with autism spectrum disorders, we focused on at what age the child was diagnosed, where they were diagnosed, who were the specialists, etc. Our main aim was to focus on educational process. We wanted to find out whether children were educated in mainstream or segregated schools, we also focused on evaluation of educational programmes, personal organization, position of the child within the group, cooperation between parents and school and other factors. The third area of our interest was the provision of support by social services. We are still working with this research sample; the research project is still running so we present here only the data we have obtained so far. Below are the specifications of the focus group. There were mainly boys in our sample which is common in autism spectrum disorders.

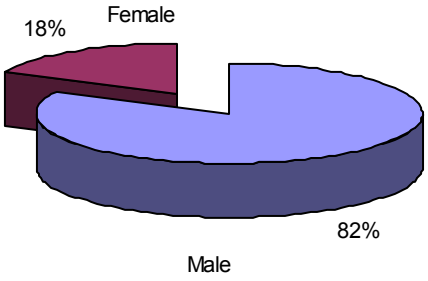

Chart 1: Representation of children and adults with ASD by gender (%)

The following chart shows the age of our respondents. Most children with ASD are aged 7-10 years. This fact is considered as random. The data in the chart can be viewed from the perspective of diagnosis. Age representation of respondents may be completely random, but we can say that the low number of children with ASD at an early age may indicate a difficult diagnosis at an early age, although children with ASD can be diagnosed as young as 18 month old (Thorová, K. 2006, p. 238). Thorová, K. (2006, p. 231) also states that it is currently not possible in the first year of life to reliably diagnose this disorder. There was a relatively large number of young people with ASD aged 16-20 years and adults aged 21-37 years, which can be considered as positive, because this means that they were diagnosed either in childhood 30 years ago when it was very difficult to diagnose ASD, or they were rediagnosed in adulthood, which is not always easy, because ASD are often confused with schizophrenia or other similar disorders. We consider it positive that these respondents are already diagnosed and therefore can get support suitable for ASD.

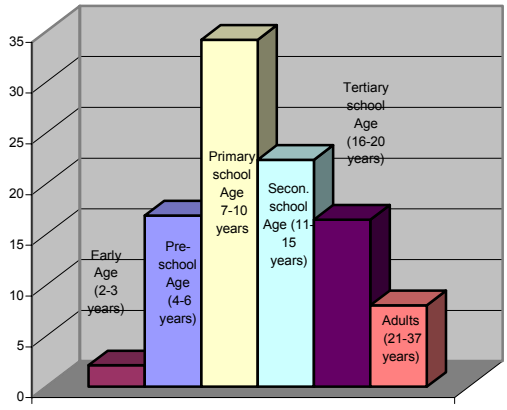

Chart 2: Age distribution of children and adults with ASD in the research sample (%)

We focused on the specific diagnosis of the person with ASD. We assumed the greatest incidence of childhood autism which was verified. Our second assumption, that the Asperger syndrome will be very common, was not verified; we expected a greater percentage in the research group. Asperger syndrome has been diagnosed quite often recently in the Czech Republic at schools so that is why we had expected a higher percentage of occurrence. It is necessary to point out that our conclusion is not possible to generalize; it applies to our research sample only.

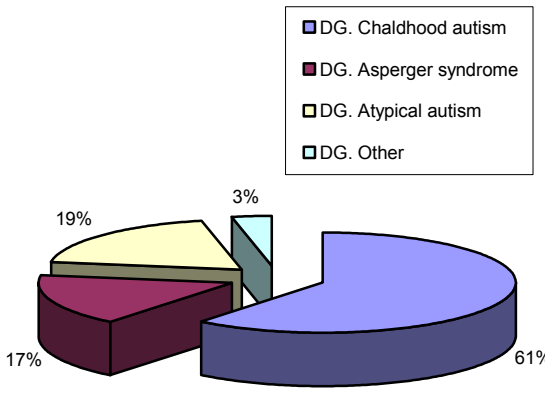

Chart 3: Representation of diagnosis form ASD in the research sample (%)

We also monitored the incidence of learning disability (intellectual disability, mental retardation) in combination with ASD. The result was very interesting; this occurrence was exactly 50%. But we must consider the fact that the developmental profiles of children with autism keep changing and that in some children, where the diagnosis is currently associated with a learning disability, there may not be any incidence of this disability in a year or two.

Another item we focused on was the incidence of epilepsy. Epilepsy is often associated with many other disabilities, autism spectrum disorders are no exception. Dr. Ošlejšková, H. (2004, 2007) conducts research in this field in the Czech Republic. In our research sample, there was only a statistically insignificant percentage (5.1) of individuals with epilepsy in combination with ASD. Almost 30% of individuals had multiple disabilities, mostly cerebral palsy or ADHD/ADD.

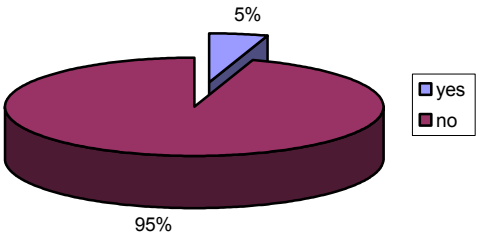

Chart 4: Representation of epilepsy in the research sample (%)

Conclusions

In this paper, we wanted to point out that students with AS and HFA are students with special educational needs and need support at schools like other students with different impairments. Although the intelligence is in the average range, the social skills are often seriously affected and may cause difficulties in an educational setting. Many teachers are not sufficiently informed about these diagnoses and do not know how to support these students. We stressed that these students should be educated in mainstream schools although it requires support. We tried to point out that AS and HFA are not the same but this is a subject of ongoing discussion among experts and professionals. We also introduced a research sample from our research project.

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Primary Paper Section: A

Secondary Paper Section: M, N, O

B PHYSICS AND MATHEMATICS

BA GENERAL MATHEMATICS
BB APPLIED STATISTICS, OPERATIONAL RESEARCH
BC THEORY AND MANAGEMENT SYSTEMS
BD INFORMATION THEORY
BE THEORETICAL PHYSICS
BF ELEMENTARY PARTICLE THEORY AND HIGH ENERGY PHYSICS
BG NUCLEAR, ATOMIC AND MOLECULAR PHYSICS, ACCELERATORS
BH OPTICS, MASERS AND LASERS
BI ACOUSTICS AND OSCILLATION
BJ THERMODYNAMICS
BK LIQUID MECHANICS
BL PLASMA PHYSICS AND DISCHARGE THROUGH GASES
BM SOLID-STATE PHYSICS AND MAGNETISM
BN ASTRONOMY AND CELESTIAL MECHANICS, ASTROPHYSICS
BO BIOPHYSICS

ELECTRICITY METERS USED IN THE RAIL TRACTION

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The author is a scholarship holder of project entitled "Innovative education without restrictions - an integrated development of the Technical University - university management, modern standards of education and strengthen the ability to hire, and persons with disabilities " supported by European Social Fund.

Abstract: In the paper was comparing the properties of high voltage transducers used in the active traction electric meters.

Keywords: traction electric meters

1 Introduction

Measurements of DC electrical energy consumed by electric locomotives and electric traction seem to be very easy. Until recently, when the electric locomotives drive used DC motors, there have been constant current and voltage waveforms in the traction network. Their values depended on the load of the network in which they appeared. At present modern electric locomotives drivers are based on alternating current motors controlled by electronic power converters. For this reason, the network current and voltage waveforms are deformed. In this case, to measure the electrical energy absorbed by the railway rolling stock, the electric meter calibrated by constant current and voltage signals can not be used. [1,2]

The internal structure of currently produced electric meters assigned for railway traction can be mapped by means of the block diagram shown in Fig. 1.

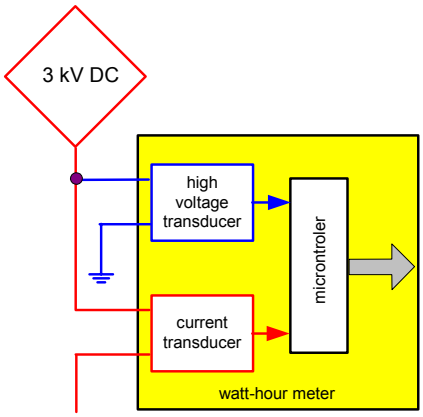

Fig. 1. The structure of the electric traction meter.

In this circuit we can isolate a high voltage measurement transducer, which assigns the voltage value supplying the electric locomotive circuit and the current transducer determining the current flowing through this circuit. In order to measure total energy absorbed by the electric locomotive circuit, i.e. through traction motors, auxiliary and heating circuits, the current transducer must be placed near the positive electric pole of the supply circuit. Output signals of both transducers are supplied into the microcontroller, which inter alia, determines the value of the active energy consumed by the locomotive during its operation.

Depending on the design solution of voltage and current transducers we can distinguish two groups of electronic energy meters.

The first group comprise meters, in the circuit of which, autonomous electronic measurement transducers such as: a high voltage transducer, which measures the traction network voltage and a transducer measuring the locomotive supply current are used. In both circuits galvanic separation isolates the system controller from the high voltage circuit supplying the drive.

The second group could include meters, which meter components presented in Figure 1, are integrated in one housing and are the part of measurement, which by radio or through an optical barrier transfers to the communication part of meter system.

Such DC electric energy meters most often require using multi-resistor voltage dividers. Because of their calibration manner, the meters are not compensated for frequency, which results in additional measurement errors occurring when a deformed waveform of the network voltage can be observed.

The paper compares the properties of voltage transducers used in the active traction electric meters.

2 Current and voltage transducers used in electric traction

Measurement of the traction network voltage can be realized by means of:
- specialized autonomous high-voltage transducers
- resistive dividers

The manufacturer of specialized high voltage transducers designed for railway rolling stock is Swiss company LEM [3]. The company has developed and implemented an electronic device marked DV. The family of these transducers includes high voltage transducers containing isolation amplifier. The transducer of this type is DV 4200/SP3 circuit shown below [4] (Fig. 2).

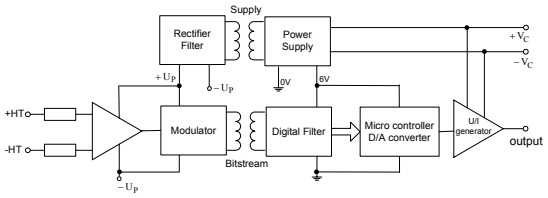

Fig. 2. High voltage measuring transducer with isolation amplifier.

In the transducer shown above the input voltage is supplied through limiting resistors to the input signal conditioner, whose output signal is changed to digital form by means of a sigma - delta modulator with analog-to-digital converter in the input. This signal is sent to the low voltage side of the transducer through a pulse isolating transformer. The sequential appearance in a low voltage circuit can be presented as follows: decoding, digital filtering and digital to analog conversion of the processed signal.

The analysis of catalog data shows that the type of the DV 4200/SP3 transducer is characterized by the frequency band from 0 to 12[kHz], the processing error not exceeding 1% and the nonlinearity error referred to 6 [kV] of value less than 0.03%. The main cause of the top-position restriction of the band frequency transducer operation is sampling frequency of voltage measured by a high primary circuit.

Unipolar form and the traction voltage network may suggest, that the measurement of voltage in the circuit of active electronic energy meter can be done, instead of a DV 4200/SP3 converter, by frequency uncompensated multi section resistive divider, to the output of which, the isolation amplifier (Fig. 3) is connected. The number of resistors R1…RN limiting the value of the

measured voltage to the level of the amplifier input voltage depends on acceptable power losses in each resistor. The value of this parameter depends on the design of resistors used in the divider system.

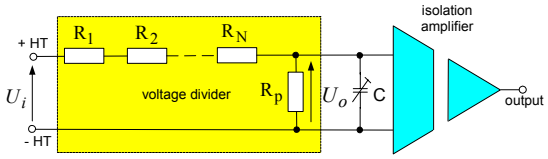

Fig. 3. Isolation amplifier with an input resistive divider.

Taking into consideration limited dimensions of the meter in the divider circuit, a miniature mass metallization resistor or resistors made in SMD technology can be applied. Manufacturers characterize indirectly acceptable power losses in these resistors and in a catalog the acceptable voltage drop do not exceed 50[V]. Therefore when the voltage of traction network equals 3[kV] DC the number of restrictive divider resistors N can not be smaller than 60. The application of such a large number of resistors in the active energy meter forces the manufacturers of active energy traction meters to arrange these resistors in parallel on the edge of the mounting plate, as shown in Fig. 4.

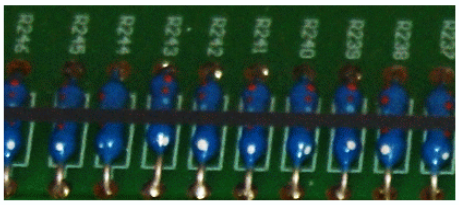

Fig. 4. The arrangement of restrictive resistors on the mounting plate of energy meter.

A divider with restrictive resistors arranged in parallel would impose an additional frequency component to the error of processing power meter, if the voltage of the traction was constant. In fact, the traction network voltage is unipolar, pulse with fast-changing fault and it depends on the locomotive traction motor control and the load state of traction network. [1]. With such a waveform of measured voltage, it is not only the value of applied resistors in this divider, but also parasitic capacity between the resistors which determine the transformer voltage ratio of a divider. The value of these parasitic capacitances depends on the size and shape of the resistors applied in the circuit divider, and a distance and a potential difference between individual resistors. Figure 5 shows the characteristics curve of the dependence of capacity C between adjacent resistors on the mutual distance h between the resistors for the divider shown in Figure 4., where 60 metalized restrictive resistors with resistance value of 330[kΩ] and the acceptable power losses of heat 0.125[W] has been used.

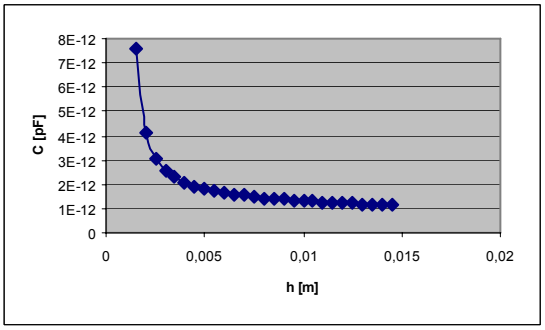

Fig. 5. Characteristics C =f(h) of the divider with metalized resistors.

The above characteristic depicts parasitic capacitances estimated at a few [pF] between divider resistors and metalized resistors can be observed. It suggests that the substitute parasitic capacitance CZ between 60 divider resistors presented in Figure 4 can reach 0.1 [nF].

In order to eliminate the influence of CZ capacitance on divider operation in the input position of insulating amplifier in parallel to measuring resistor, it is necessary to activate an additional capacitor C (Fig. 3). Activating this capacitor will enable to describe the measuring divider by means of a substitute diagram shown in Figure 6.

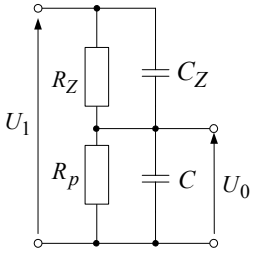

Fig. 6. Substitute diagram of high voltage measuring divider.

In Fig. 6. Rz stands for substitute resistance of restrictive resistors in series R_1 ....R_N a Rp is a measuring resistor (Fig. 3.). It can be proved that transformer voltage ratio can be described by the following expression:

$$k_u(j\omega) = \frac{U_1(j\omega)}{U_0(j\omega)} = 1 + \frac{R_Z}{R_P}\frac{1 + j\omega R_P C}{1 + j\omega R_Z C} \qquad (1)$$

The dependence proves that capacitance C of additional capacitor should be matched so that time-constant of both divider resistors were equal.

$$R_Z C_Z = R_P C \qquad (2)$$

When the value of capacitor capacitance C fulfills the condition (2), transformer voltage ratio of the divider does not depend on frequency and can be described as follows:

$$k_U(j\omega) = \frac{U_1(j\omega)}{U_0(j\omega)} = 1 + \frac{R_Z}{R_P} = 1 + \frac{C}{C_Z} \qquad (3)$$

3 Summary

The paper compares the usability of high voltage transducers applied in active traction electric meters. The first system presented is DV 4200/SP3 transducer manufactured by LEM company. Another one refers to a high-resistance voltage divider collaborating with an insulating amplifier. Both circuits apply galvanic separation so that the electric circuit could be separated from traction voltage. Contrary to LEM transducer, the resistance divider circuit requires an applicable lay-out of the resistors on the mounting plate. Moreover, it requires an accessory frequency compensation which can be done by accommodating an insulating amplifier in the input position, and apart from a measuring resistor, also, an additional capacitor whose value depends on the parasitic capacity between individual resistors. Therefore it is advisable to use high voltage transducers in active energy traction meters in mass production.

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Primary Paper Section: B

Secondary Paper Section: JB

"STUDY OF ATMOSPHERIC PRESSURE" - A PROJECT UTILISING REMOTE EXPERIMENTS

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The contribution was elaborated with the financial support of the Slovak Republic Ministry of Education KEGA - grant No. 3/7227/09.

Abstract: The paper presents an application of Integrated e-Learning (INTe-L) in the project-based learning in university environment. It introduces the project assignments in Mechanics for the bachelor students majoring in "Teaching General Subjects". An important component of the educational process is laboratory work comprising an assignment targeted at the study of atmospheric pressure in a selected month in the towns of Trnava, Prague and Porto via real remote experiments on the Internet. The project steps include: collecting a certain amount of experimental data, processing it into tables and graphs using Origin software, and analysing the results. The implementation of INTe-L strategy into project-based learning in Natural Science and Technology subjects contributes to the integrated education in a highly interactive for

Keywords: atmospheric pressure, physics, integrated e-learning, project learning

1 Introduction

A method of Integrated e-Learning [1] based on utilising real, real remote and virtual experiments supported by e-learning materials has been applied for several years in training the students majoring in "Teaching General Subjects" study programmes in both bachelor and master degrees in the Department of Physics, Faculty of Education, University of Trnava. The INTe-L strategy is successfully being used in project teaching through integrating its components into the project assignments in Physics. The INTe-L-based project presented in this paper deals with measuring the atmospheric pressure in a selected period via real remote experiments in the laboratories located at the University of Trnava, Charles University in Prague and University in Porto, and are available free on the Internet.

2 Assigning the project by using the Integrated e-learning

The project topic: Study into the course of atmospheric pressure in a selected month in Trnava, Prague and Porto.
Motivation: Dear students, the objective of this project is the measurement of atmospheric pressure in Trnava (Fig. 1), Prague (Fig. 2) and Porto (Fig. 3). The atmospheric pressure is one of the meteorological issues we are being informed about every day. A human organism is permanently exposed to the effects of atmospheric pressure p_a. The atmospheric pressure p_a cannot be calculated from the relation $p_a = \rho hg$, since the air density changes with elevation. When ascending by 100 m, p_a decreases by approximately 1.3 kPa. Atmospheric pressure p_a changes also within the day. To forecast weather, forecasters have to be familiar with those changes. Do you want to know what the current atmospheric pressure in Trnava, Prague and Porto is? If so, you are welcome to visit the weather stations in real remote experiments at the Departments in three workplaces, located on the Internet: Faculty of Education, University of Trnava, Faculty of Mathematics and Physics, Charles University in Prague, Faculty of Engineering, University of Porto.

Figure 1 Trnava [2]

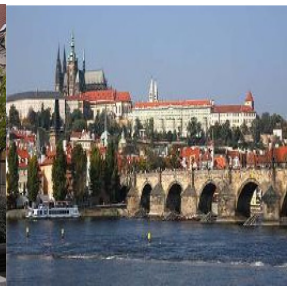

Figure 2 Prague [3]

Figure 3 Porto [4]

Read the project assignments carefully, and then start working. Work out the project on the basis of the knowledge acquired from textbooks, journals, encyclopaedias and consultations with teacher or other experts.

Basic principle of measurement: Atmospheric pressure in Trnava and Prague is measured by means of a manometer, an ISES unit, and is calculated for the sea level (taking into account the correction for the elevation of the place where the probe is located). The weather station in Porto is equipped with a Micromec Logbox centre. The software application collecting and recording the data from the station inside the data-basis (data logger) allows sharing the data on the website with the Internet. This automatically restarts the measuring cycle and synchronises the date and time recorders. The application was developed by means of LabVIEW 8.5.

To access the remote weather stations in Trnava [5], Prague [3] and Porto [6] by the Internet, students can use any web browser (MS Internet Explorer, Firefox, Opera, Netscape etc.) enabling Java support. Java must be installed (can be downloaded free on www.java.com) and active.

The project aim: The project aim is defined by the syllabus context of the subject of Mechanics for the 1st year bachelor degree students majoring in "Teaching General Subjects": physics with combination: mathematics, biology or English language and literature", and comprises the following steps:

- Acquiring information;
- Evaluating the acquired information;
- Discussing, co-operating and proposing solutions;
- Using the Internet and specialised literature to look up further information;
- Collaborating and bearing responsibility for the assigned tasks;
- Processing the information in a selected way;
- Presenting information without the loss of information value;
- Integrating the acquired knowledge into the real environment;
- Distinguishing independent and dependent physics variables;
- Developing language skills in mother tongue and foreign languages.

Time allotted: 1 week.

Skills involved: Students should have mastered the basic PC and Internet operations, work with Word text editor, Excel or Origin, and PowerPoint program.

Background: WWW sites devoted to the topic, Halliday, D. – Resnick, R. – Walker, J. Physics, Part 1 – Mechanics, VUT in Brno, encyclopaedia and other professional literature.

Specific tasks:

a) Collecting specific literature, e.g. encyclopaedia, professional publications, journals, electronic textbooks, etc.

b) Acquiring the materials necessary for the project implementation.
c) Installing Java program into PC.
d) Buying related CD-ROM.

Organisation: Students work in teams of three. After consultations with teacher, each team appoints the following positions:

- **Secretary** – a student who records the acquired information and procedures, and takes notes from teammates.
- **Organiser** – a student who organises the project work and bears responsibility for keeping the workplace clean and neat.
- **Presenter** – a student who presents individual projects to other teams and teacher.

The project venue: Physics classrooms at the Physics Dept., Faculty of Education, University of Trnava, students' households.

Cross-subject relations: Physics, Informatics, Mathematics, Environmental education, Slovak language, English language, Czech language and Geography.

Procedure:

1. Familiarising students with the project topic.
2. Familiarising students with the project objectives and tasks.
3. Selecting the presentation form (poster, PowerPoint presentation, Word doc, etc.).
4. Specifying the way of evaluation.
5. Searching information.
6. Elaborating projects.
7. Presenting projects.
8. Discussing individual projects with other teams.
9. Evaluating the outputs of individual teams.

Task 1:

a) Describe the remote experiments located in Trnava, Prague and Porto, on:
   - http://kf.truni.sk/index.php?option=com_content&view=article&id=59&Itemid=79;
   - http://www.ises.info/index.php/sk/laboratory/experiment/meteorological-station-in-prague;
   - http://experimenta.fe.up.pt/estacaometeorologica/index.php;

   and their arrangement and thing and write about differences.
b) Find the elevation of Trnava, Prague and Porto.
c) Find the values of atmospheric pressure on a selected day, month and year, measured by the weather station located in e-Laboratory at the Physics Dept., Faculty of Education, University of Trnava, website http://kf.truni.sk/.
d) In the displayed graph, observe the local maximum (the maximum value of atmospheric pressure) and local minimum (the minimum value of atmospheric pressure) in a selected period in one-hour intervals.
e) Determine the local extremes and global extreme, mean value and the most abrupt change of atmospheric pressure and the greatest rate of change (slope of pressure function).
f) Arrange the measured values of the atmospheric pressure in Table 1 using Excel or Origin programs.
g) Using the measured values, plot the curve of the atmospheric pressure dependence on the time (one-hour interval) for the given period.
h) Find the mean daily value of the atmospheric pressure $\overline{p_{a1}}$ and plot the graph.
i) Determine the sum of square of the deflections from the mean value and determine the sum of the positive and the negative deflections from the mean value in Table 1.
j) Calculate the standard deflection from the mean value.

Task 2:

a) Compare the course of atmospheric pressure and all the data determined in Task 1 for the same period with the data from the weather station located in the Project e-laboratory at the Faculty of Mathematics and Physics, Charles University in Prague on www.ises.info, and the Faculty of Engineering, University of Porto on http://experimenta.fe.up.pt/estacaometeorologica/index.php.
b) Transfer the measured values of atmospheric pressure into Table 2 in Excel or Origin programs and follows the same scheme of elaboration as in previous (Task 1d) -1 j).

Task 3:

a) Compare the course of atmospheric pressure in Prague in Task 2 for the same period in three consequent years and follows the same scheme of elaboration as in previous.
b) Transfer the measured values of atmospheric pressure into Table 3 in Excel or Origin programs.
c) Using the measured values, plot the curve of the time dependence of atmospheric pressure (one-hour interval) for the selected period.
d) Find the mean daily values of atmospheric pressure, $\overline{p_{a4}}$, $\overline{p_{a5}}$ and $\overline{p_{a6}}$ for the selected period and plot all the graphs into one figure.
e) Determine the total of square deflections from the arithmetic average; determine the total of deflections from the mean value from positive and negative values.
f) Calculate the standard deflection from the arithmetic average.

Equipment and aids: Remote experiments located in Physics Dept., Teacher-training College, University of Trnava, Faculty of Mathematics and Physics, Charles University in Prague and Faculty of Engineering, University of Porto, PC with Internet.

Description of equipment: The weather station at the Faculty of Engineering University of Porto (FEUP) (Fig. 4) comprises an anemometer, a wind rose, pyranometer for measuring solar radiation, rain gauge, sensors for measuring relative air humidity, temperature and atmospheric pressure, and pyrgeometer for measuring the atmospheric infra-red radiation spectrum.

Figure 4 Weather station at the Faculty of Engineering, University of Porto [6]

The measuring hardware of weather stations at the universities in Trnava and Prague consists of ISES (The Internet School Experimental System) and the attached modules: thermometer, pressure gauge and light sensor (Fig. 5). Software used for the

remote experiments and the server-client connection was modular ISES WEB Control software. The thermometer is protuberant form the window for about 20 cm (Fig. 6), the manometer is located inside the laboratory and the photometer is focused horizontally to the sky. In fact, the photometer is not a heliograph, as it does not collect sunshine from the whole hemisphere. The thermometer is partly shielded from the direct solar radiation.

Figure 5 Experimental arrangement of the remote experiment "Weather monitoring" in Trnava, utilising an ISES set, www.ises.info

Figure 6 Experimental arrangement of the remote experiment "Weather station" in Prague, utilising an ISES set, www.ises.info

Measurement procedure:

Task 1

a) Click http://kf.truni.sk/, to enter e-Laboratory.
b) Find the experiment by the title "Weather monitoring".
c) Select "Start the experiment" from the menu on the web by clicking the link.
Note: A short delay may occur due to the delay in connecting your computer to the corresponding server and retrieving data. Be patient. After a while, depending on the speed of your connection, you can see the current values of atmospheric pressure, temperature and intensity of solar radiation in Trnava.
d) Click "Measuring the atmospheric pressure", select the period of the record; choose the identical day and month of the last year, then click "Graph".
e) The graph enables viewing local maxima (minima) and global maximum (minimum) of the atmospheric pressure over the selected period.
f) Notice the labelling of both independent and dependent physical variable scales.
g) Look at the graph and identify the lowest and the highest values of the atmospheric pressure (global extreme) over the selected period in one-hour intervals.
h) Determine the local extremes, mean value and the most abrupt change, of atmospheric pressure and the greatest rate of change (slope of pressure function).
i) Transfer the measured values of atmospheric pressure into Table 1 in Excel or Origin programs.

Table 1 Measured values of atmospheric pressure in Trnava of.....

Measurement No	t [h]	p_{a1} [hPa]	Δp_{a1} [hPa]	p_{a1}^2 [hPa^2]
1 . 24				
		$\overline{p_{a1}} = \ldots$		

j) Using the measured values, plot the curve of the time dependence of atmospheric pressure (one-hour interval) for the selected period.
k) Determine the mean daily value of the atmospheric pressure $\overline{p_{a1}}$ for the selected period and plot the graph.
l) Determine the sum of square of the deflections from the mean value, determine the sum of the positive and the negative deflections from the mean value in Table 1.
m) Calculate the standard deflection from the arithmetic average σ_{p_1}.
n) Record the resulting average daily value of atmospheric pressure $p_{a1} = \overline{p_{a1}} \pm \sigma_{p_1}$.

Task 2

a) Click www.ises.info to enter the Project of e-laboratory.
b) Look up the experiment by the title "Weather station in Prague", start it and follows the same scheme of elaboration as in previous Task 1, it mean.
c) After opening the page "Pressure monitoring", select the time interval of the record, choose the identical day and month of the last year as in Task 1 and click "Display".
d) Compare the courses of the values of atmospheric pressure and all the data determined in Task 1 from the same period with the data from the weather station located in the Project e-laboratory at the Faculty of Mathematics and Physics, Charles University in Prague.
e) Transfer the measured values of atmospheric pressure into Table 2 in Excel or Origin programs.

Table 2 Measured values of atmospheric pressure in Prague of.....

Measurement No	t [h]	p_{a2} [hPa]	Δp_{a2} [hPa]	p_{a2}^2 [hPa^2]
1 . 24				
		$\overline{p_{a2}} = \ldots$		

f) Using the measured values, plot the curve of the time dependence of atmospheric pressure (one-hour interval) for the selected period.
g) Determine the mean daily value of the atmospheric pressure $\overline{p_{a2}}$ for the selected period and plot the graph into the same picture in point f).
h) Determine the sum of square of the deflections from the mean value, determine the sum of the positive and the negative deflections from the mean value in Table 2.
i) Calculate the standard deflection from the arithmetic average σ_{p_2}.
j) Record the resulting average daily value of atmospheric pressure $p_{a2} = \overline{p_{a2}} \pm \sigma_{p_2}$.
k) Click http://experimenta.fe.up.pt/estacaometeorologica/inde

x.php to open WWW of the weather station at the University in Porto.

l) After opening the page in the part of "Database", select the time interval of the record, choose the identical day and month of the last year as in Task 1, and click the empty square next to the title "Atmospheric pressure", then click OK. You open a document in Excel program with the measured values of atmospheric pressure for the selected period.

m) Compare the courses of the values of atmospheric pressure and all the data determined in Task 1, from the same period with the data from the weather station located at FEUP.

n) Transfer the measured values of atmospheric pressure into Table 3 in the Excel Origin programs.

Table 3 Measured values of atmospheric pressure in Porto of.....

Measurement No	t [h]	p_{a3} [hPa]	Δp_{a3} [hPa]	p_{a3}^2 [hPa^2]
1 . 24				
		$\overline{p_{a3}} = \ldots$		

o) Using the measured values, plot the curve of the time dependence of atmospheric pressure (one-hour interval) for the selected period.

p) Determine the mean daily value of the atmospheric pressure $\overline{p_{a3}}$ for the selected period and plot the graph.

q) Determine the sum of square of the deflections from the mean value, determine the sum of the positive and the negative deflections from the mean value in Table 3.

r) Calculate the standard deflection from the arithmetic average from σ_{p_3}.

s) Record the resulting average daily value of atmospheric pressure $p_{a3} = \overline{p_{a3}} \pm \sigma_{p_3}$.

Task 3

a) Compare the course of atmospheric pressure in Prague in Task 2 over the same period of three consecutive years.
Note: You can get the data of 3 May 2003, when the experiment was launched. The record of the whole interval is rather inconsistent (several distortions, the building refurbishment, server maintenance etc.). Many experimenters (clients) can connect simultaneously. You can view their addresses in the box "Connected users"

b) Transfer the measured values of atmospheric pressure p_4, p_5, p_6 into Tables 4, 5 and 6 in Excel or Origin programs.

Table 4 Measured values of atmospheric pressure in Prague of.....

Measurement No	t [h]	p_{a4} [hPa]	Δp_{a4} [hPa]	p_{a4}^2 [hPa^2]
1 . 24				
		$\overline{p_{a4}} = \ldots$		

Table 5 Measured values of atmospheric pressure in Prague of.....

Measurement No	t [h]	p_{a5} [hPa]	Δp_{a5} [hPa]	p_{a5}^2 [hPa^2]
1 . 24				
		$\overline{p_{a5}} = \ldots$		

Table 6 Measured values of atmospheric pressure in Prague of.....

Measurement No	t [h]	p_{a6} [hPa]	Δp_{a6} [hPa]	p_{a6}^2 [hPa^2]
1 . 24				
		$\overline{p_{a6}} = \ldots$		

c) Using the measured values, plot the curve of the time dependence of atmospheric pressure (one-hour interval) for the selected period (individual years) and a common graph in dependence of the atmospheric pressure as time function (one-hour interval) for all the years surveyed.

d) Find the average daily values of atmospheric pressure $\overline{p_{a4}}$, $\overline{p_{a5}}$ and $\overline{p_{a6}}$ for selected period and plot them in graphs.

e) Determine the sum of square of the deflections from the mean value, determine the sum of the positive and the negative deflections from the mean value in Tables 4, 5 and 6.

f) Calculate the standard deflection from the arithmetic average for individual measurements σ_{p_4}, σ_{p_5} and σ_{p_6}.

g) Record the resulting mean daily value of atmospheric pressure for 4 years and plot the curve in the graph of the dependence of atmospheric pressure on time (one-hour interval) for all the years surveyed.

h) Discuss the results of measurements, prepare conclusion.

Project evaluation: Point scale 1 – 20 points. A student can acquire:

10 points max. for quality of the topic explanation, according to the following criteria: topic development (2 points), topic coverage (2 points), comprehension of classmates (2 points), raising the interest (2 points), achieving the objectives and tasks of the assignment (2 points).

10 points max. for the form of presentation and related visuals: poster – own drawings, concise data, physical relationships, summary details, symbols and unit of physical quantities, schemes, pictures form journals, PowerPoint presentations, Word documents etc.

3 Conclusion

Atmospheric pressure p_a is a major meteorological element. The pressure is an important environmental quantity, influencing straightforward daily our psychic and mood. Its changes and the rate of those changes are very important in weather forecast. The increase of atmospheric pressure usually indicates the advent of sunny weather p_a with low clouds, while the decrease of pressure indicates the accession of cloudy and rainy weather. Generally, people hardly realise the influence of p_a on a human organism in everyday life, except for those sensitive to weather changes. The goal of the project was to show how meaningful is possible to utilize the internet and remote experiments in education process.

Our experience with project learning showed that, besides acquiring the required knowledge of Physics, students enhance their information literacy, while realising the relationships of various physical phenomena with real world. Also during the active work the students enhanced their skills how to process bulk of date, their processing and evaluation, how to create graphs, how to insert more graphs into one figure, etc.

The new form of project learning with remote experimenting via the Internet proves to be a suitable motivation element in learning the subjects of Natural Science and Technology.

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Primary Paper Section: B

Secondary Paper Section: AM

E BIOLOGICAL SCIENCES

EA MORPHOLOGICAL GAME PARKS AND CYTOLOGY
EB GENETICS AND MOLECULAR BIOLOGY
EC IMMUNOLOGY
ED PHYSIOLOGY
EE MICROBIOLOGY, VIROLOGY
EF BOTANY
EG ZOOLOGY
EH ECOLOGY - COMMUNITIES
EI BIOTECHNOLOGY AND BIONICS

HOW IMPORTANT IS LIVING TOGETHER? THREE FACETS OF SYMBIOSIS CONCEPT

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This text is one of the outcomes of my Ph.D. research in the programme "Theoretical and evolutionary biology" on Charles University, Faculty of Science.

Abstract: The conception of symbiosis as biological interactions between different species is well established in contemporary biology since its introducing in late 19th century by A. de Bary. However, to date, symbiosis is primarily understood to be an ecological concept despite of its "Janus" face in form of the evolutionary importance of the phenomenon. In 1909, K. Merezhkovsky coined the term symbiogenesis for expression the fact that new species can arise throughout symbiosis, and much more later, in the scond half of the twentieth century, L. Margulis has shown that symbiosis is a crucial aspect of process of evolution. I argue here that there is yet another facet of the term, which results from the previous, but yet it is autonomous: symbiosis as a universal model for theoretical biology.

Keywords: science of life, theoretical biology, symbiosis, symbiogenesis

1 The Birth of Symbiosis: Transparent Relationships on higher Levels of Organization

The term *symbiosis* (from Greek, meaning "living together") was introduced into biology by German botanist Heinrich Anton de Bary (1831-1888) in 1879. However, de Bary previously used the word in a speech at the Congress of German Naturalists and Doctors at Kassel in 1878. Even one year before another German botanist Albert Bernhard Frank (1839-1900) coined the term *symbiotism*, which was semantically *de facto* identical. De Bary defined symbiosis as "the living together of unlike named organisms" (Sapp 2003; 1994) and up to present days, the definition still holds more or less, since symbiosis is described as close relationship of two or more phylogenetically (that is what "unlike names organisms" means in practice) distinct organisms.

In fact, these converging efforts were a natural result of an attempt to grasp intellectually the recent discovery of Swiss botanist Simon Schwendener (1829-1919) who showed that lichens are dual organisms composed of the fungus (typically a member of the Ascomycota group) associated with green algae (commonly *Trebouxia* or *Nostoc* genus). At the same time, the terms as parasitism, comensalism, as well as mutualism were defined by Belgian zoologist Pierre-Joseph van Beneden (1809-1894), who derived them from *per analogiam* projection of human society (Sapp 1994). As a consequence, the symbiosis concept of de Bary firstly included all possible complex associations on a parasitic-mutualistic scale, and secondly became a new paradigm of biological sciences how to look at the nature of interactions between living beings (more precisely the living objects, in terms of modern scientific language) as counterbalance to the Darwinian "struggle" (Darwin 1985) (note that struggle is more specific then "fight", the semantic realm is wider and closer to "efforts to").

During the last decades of the nineteenth century, many botanists (because they were botanist, who payed attention to one-cell organisms) used the scheme outlined by van Beneden for the classification of the various functional relationships involving microorganisms. The main attention was focused primarily on organisms at the interface of plant and animal kingdom, i.e. on chlorophyll-containing protists, and some procaryotes – although the term procaryotes as well as eukaryotes still did not exist and bacteria as so-called Schizomycetes belonged to kingdom of plants. Moreover, some kinds of facts like the association of bacteria with legumes or corals with photosynthetic algae did not escape this new perspective. It was crucial in this regard the gradual appreciation of the phenomenon of mycorrhizal symbiosis, which was noticed and described by above-mentioned A. B. Frank in 1885; Frank is also the author of the generally known term mycorrhiza, symbiosis of fungal mycelium and roots of higher plants. It should be mentioned that this kind of discovery is not trivial matter and it alone would be a great success. Frank's benefit, however, went even further: he said that fungi in this strange association in some way favor the plant, so their function is *positive*. This belief, however, encountered stiff resistance of his contemporaries, which is understandable, because there was no precedent for cooperative behavior on such level (or in general: life was seen as competition, the struggle for existence) and fungi were generally considered as typically parasitic organisms.

Nevertheless, a clear definition (*clare et distincte* along to Descartes) of symbiosis has never existed and the problem of ambiguity persists to present. Since its introducing, the term was associated with two basic approaches to defininition: either as a synonym for mutualism in narrower sense (with an apparent Achilles heel in the form of essentially anthropocentric evaluation of benefit-cost on information basis known *ad hoc*), or in the original intention of de Bary as any close cohabitation of different organisms, regardless of the specifity of interactions, especially the trophic ones – i.e. including all forms of interrelation that somehow affect, either positively or negatively, the survival of the particular partners. The thing is, however, that the phrase "any close cohabitation" is virtually beyond the possibilities of any precise definition. Nonetheless, regardless of choosing any of these two basic ways of symbiosis understanding, it started becoming obvious for supporters of both approaches that it were bacteria what played a significant role in symbiosis – if only because, due to their size, they always meet the requirement of "close" living with partner organism. Moreover, just emerging science of cell biology could not fail to notice some similarities between bacteria and some of the inner structures of eukaryotic cells; and this was very important observation.

After its discovery, symbiosis soon became considered to be a form of interaction between different organisms in which joint existence is beneficial for the individuals and secures for the partners an essential selective advantage. Thus, the value of symbiosis was defined by the fact that, upon entering into an association, an organism became better adapted to the environment because of the use it makes by the peculiarities already possessed by its partner (Khakhina 1992). Despite this apparent evolutionary dimension, symbiosis has been (and still is) in the first place an ecological concept (even thought ecology as separate discipline was only forming at that time): it comprise knowledge about "true" organisms before our very eyes, studied by botanist or zoologist. So the **ecological aspect** is the first and most common facet of symbiosis concept, which legacy we can find up to present in ways of how to teach this topic: as a part of ecology, with respect to specific examples in nature, scattered throughout many otherwise unrelated fields of research.

Nevertheless, the second facet of symbiosis concept – one can even say its Janus face – is, as has already been written (Sapp 1994), the **evolutionary aspect** of that phenomenon.

2 The Evaluation of Symbiosis: Relationships hidden in Time

Under the weight of a new arising knowledge, it has become suddenly clear to some researchers that the interactions with symbiotic bacteria play an important role in living world and are probably not an obscure and/or marginal phenomenon (bacteria are due to their volume and their cellular properties practically ubiquitous; you can find them in deep ocean as well as in the Earth's crust to a depth of several kilometers), but apparently the fundamental basis of life-processes. The dual nature of lichens, nitrogen fixing bacteria, mycorrhizal fungi or photosynthetic algae living in the bodies of various protist suggested time and space-depending continuum of both organisms from the partially to complete interdependence.

In this regard, symbiotic interactions can be divided into a continuous range of mutual dependence of both partners, where on the one side are endosymbionts long established within the cell like mitochondria or chloroplasts (and, in fact, eukaryotic cells themselves), or endosymbionts living inside the bodies of other organisms. On the other side are external interactions. Given that bacteria are everywhere around us, in all habitats and all environments, microbial symbioses are ubiquitous, and their importance is in no case marginal (eg. Hoffmeister & Martin 2003): bacteria can perform many of activities impossible for their hosts, such as photosynthesis, sulfur metabolism, nitrogen fixation, digestion of cellulose, the synthesis of amino acids, vitamins, growth factors, sugars, or enzymes, etc.

The ingenious combination of these findings with cytology, which showed the presence of self-reproducing bodies inside the cells of plants and animals, has led some biologists to believe that this cellular organells, and possibly even eukaryotic cells themselves, are possibly symbiotic structures, it means organisms/organells of symbiotic *origin*. One of the first important researchers on this field was Russian botanist Andrey Sergeevich Famintsyn (1835-1918).

Thus, what happened was the redirecting of prevalent way of thinking about symbiosis; in other words, the transition from ecological relations to relations physiological, and later also cellular. That was a crucial point, because there were found structures similiar to free-living procaryotic organism in eukaryotic cells. Was it mere coincidence? How did these structures originate? What can we say (if it is possible at all) about their evolution?

During the end of nineteenth century, the possibility of evolution by the sudden, radical steps, in contrast to gradualistic processes, has been abundantly discussed. And here comes again the symbiosis on the scene: because one of the ways how to break statistic improbability of such non-gradualistic evolution is increasing of complexity through the union of previously prepared blocks, i.e. through fusion of previously symbiotically living systems. So, the possibly role of symbiosis in evolution gave birth to a new term, *symbiogenesis* (i.e. "born from symbiosis"), introduced by Russian botanist Konstantin Sergeevich Merezhkovsky (1855-1921) in 1909 and explained as "the origins of organisms through combination and unification of two or many beings, entering into symbiosis" (Khakhina 1992).

Between years 1905-1918, Merezhkovsky wrote a serie of articles where he argued that chloroplasts, then called chromatophores, are actually symbiotic micro-organisms inside cells, and that nucleus and cytoplasm also emerged through a blend of two distinct phylogenetic lines. On the opposite side of the Atlantic ocean, in the United States, argued during the thirties an American Ivan Emanuel Wallin (1883-1969) in favor of the symbiotic origin of mitochondria from the originally independent microbial partners of individual cells. Wallin was a great promotor of the idea of symbiogenesis and particularly its role in the evolution of species (Wallin 1927). Similar ideas about the importance of symbiosis were circulating marginally throughout Europe – fundamental is the work of Russian scientists (Kozo-Polyansky 2010; Khakhina 1992) (besides experimental researchers like Famintsyn and Merezhkovsky also researchers-theoretician like Boris Mikhaylovich Kozo-Polyansky, 1890-1957); in France is known a work of Paul Jules Portier (1866-1962) (Sapp 1994); and also several others (Khakhina 1992). But with the exception of those few, no more scientists was interested in this topic until the sixties.

At that time, American microbiologist Lynn Margulis (1938-) has completely independetly of her predecessors "rediscovered" the forgotten concept of symbiosis as a possible major factor in evolution and its participation on important evolutionary events - in this case on a process of origin of some cellular organelles. Increasing evidence led Margulis in the sixties to formulating and publishing the so-called theory of serial endosymbiosis (Margulis & Sagan 2002; Margulis 2000), under which the eukaryotic cell is a conglomeration of various bacterial partners. The answer of academicians was of course very inconsistent. Leading figures of biological research were quick in claim that the whole concept is unscientific because it is quite possible to test it.

Soon, however, it has begun to show that Margulis was probably right: it has been found that mitochondria and chloroplasts contain their own DNA and the electron microscope also confirmed their structural similarity with bacteria. Consequently, in the eighties, molecular biology proved without any doubt similarity of DNA sequences in chloroplasts with those from DNA of cyanobacteria, and sequences in mitochondrial DNA with those from DNA of alpha proteo-bacteria group – and *de facto* confirmed in this way their common origin from once free-living microbial ancestors. Thus, despite the early self-conscious receiving over the scientific community, theory of influence of symbiosis in process of evolution has been soon accepted and has became one of the fundamental concepts in modern biology (Douglas 2010, 1994; Khakhina 1992; Margulis 2000; Margulis & Sagan 2002, Margulis & Fester 1991; Overmann 2006; Paracer & Ahmadjian 2000; Sapp 2003, 1994; Smith & Douglas 1987).

Symbiosis (as relationship), and especially its possible effect, symbiogenesis as a process by which a new organisms, i.e. species (sic!) may arise, has been rehabilitated from the phenomenon of marginal importance to the essential element of many biological fields of research and became the next vanishing point of evolutionary biology, parallel to the newly developing post-neodarwinism in form of selfish-gene theory (Dawkins 2006). Accordingly, besides the classical neodarwinism, where the driving force for natural selection are only mutation, an alternative evolutionary model for arising of new entities in evolution has developed since the seventies: symbiogenesis, evolution by merging into symbiotic complex and their follow-up fusion (on evolutionary time scale). It has never achieved greater public acclaim, though current knowledge of the evolution of both prokaryotes and eukaryotes clearly show that it should be definitely not underestimated. Surprisingly, although the symbiosis as one of the major sources of evolutionary innovations have been proposed since its inception in the nineteenth century, we do not find this idea in any standard histories and treatises on evolutionary biology (Sapp 2003).

This is partly caused because "classical" evolutionary biology was primarily formed and focused on evolution of higher groups of eukaryotes, i.e. on evolution after so-called Cambrian explosion; in other words, on last 600 million years (and, additionally, it was rather zoocentric). But this is not even 80% of the history of life on Earth, if we realize that its origin is traditionally dated to around 3.5 billion years in the past. If we want to consider the evolution as a whole, it is necessary to expand beyond its zoocentric part (in fact just a component). It is clear now that the evolution of prokaryotes, including the origin of eukaryotic cell itself, is an important part of the whole theory of evolution. Symbiotic interactions leading to symbiogenesis have acquired in evolutionary biology its irreplaceable status, for it is apparent that they have played a central, major role in the emergence of novelties in phylogeny within the "tree of life" (or rather "web of life"? – see in Sapp 2009).

Current biology simply cannot disregard no longer the matter of fact that any individual eukaryotic organism is, and has evolved, as a result of an extremely complex consortium of many species, which (metaphorically) must "strive" (as opposite of "struggle") for coexistence through joint cooperation on the functional integrity of the whole. It is a sophisticated ecosystem of cross-linked connections of linkages, where the resulting character always depends on the context of other relationships in which it is located.

Finally, this bring us to the third facet of symbiosis concept, that is indirectly (but fundamentally) resulting from previous two: the

aspect of universality of a principle. It is *interactions*, no matter on level, what is the best model for description of *specifity of biology* as science (see below), hence symbioses as *biological* interactions are the most appropriate model for field of theoretical biology, because it can enable, I suppose, re-establishing of foundations of biology as a coherent system of inter-linked knowledge. Moreover, there could be a possibility in future to put science of biology togehter with humanities on the same theoretical basis and thus overcome ancient nature vs. nurture debate.

3 The Meaning of Symbiosis: Relationships as true "Missing Links"

Biology as so-named separate science is relative new invention of Late Modern Age. Examination of living and knowledge of life sciences was always, quite naturally, an integral, implicite part of medicine, which, however, and not pejorative, was not any *–logy* (from greek word *logos*), but rather traditional teachings based on exchange of experiences. However, *post factum* of that specific transition of knowledge of life into bio-*logy* as a separate science, all knowledge yet collected was needed to fit now within a defined core which are to be living beings. But it is really not easy to find something unquestionably specific on life, a kind of standard in biology. Be alive seems to be appropriate term for all (hylozoisms), or, conversely, for nothing (modern mechanism). Modern period requires an object, a fungible item, but new science of biology hardly offers something like it – rather it seems as a great collection of pragmatism and teleology in nature. The undeniable autonomy of life whispers stilly what Immanuel Kant expressed by words that no further Newton for field of biology will be ever exist. *In medias res*, in other words, how to make a living things objectively knowable, contributed at the late nineteenth century cellular physiology, and, finally, several decades later came the definitive answer through the molecular biology.

Nevertheless: any way the biology is ultimately convertible to physico-chemical principles expressible through mathematical notation, there is still something beyond (in words of M. A. Simon (1971): "Biology differs from physical science because its objects are different."). Something, we do not treat with in these disciplines (and therefore we cannot it yet), whereas for biology it is crucial and specific: **the meaning** (in sense of context-dependend information, no teleology there). The first indications of this fact began to appear in the first half of the twentieth century through the forming systems theory, based on newly emerging science - cybernetics. The subsequent formulation of information theory and the obvious analogy with some of the most essential features of living organisms, such as with the text-like nature of DNA primary structure or the genetic code, which have been discovered during the fifties and the sixties due to molecular biology, has led to the introduction of the concept of information into the biological sciences. Despite the widespread enthusiasm in adoption of information into the arms of biologists, yet there has been the general underestimating of the complementary phenomenon of the true meaning. Actually, any information is information **only** in connection with something (nothing super-natural: let say "an adjusted system") *what recognize it as such*, and must therefore bear some meaning for a recipient (it means for this system) (Markoš *et al.* 2009).

Biology, in contrast to other sciences, is enriched by the critical dimension of information. Physics or chemistry only need the description of the alphabet and simple grammar which is quite sufficient for them, but *does not deal with meaning*: do not try (because do not need) to understand the dimension of, for instance, natural (as opposite to formal) language, which can be seen just up in the phraseme or in the Shakespearean verse (Markoš & Faltýnek 2010). Living organisms are complex areas of mutual ties with historically established background, among which exist significant flows of information. A comprehensive study of such systems is very difficult task, so the (molecular) biology is logically limited to the study of isolated subsystems – specific information pathways and their importance in the next proximal system above. A more complete evaluation of the meaning as quantity is hampered by the very fact that the meaning as a scientific concept is not yet properly defined – because the exact and empirical sciences have never needed it.

The point is, that this principle of such spatio-temporal coherence of living systems based on these ties, interrelations, relationships of things, is what is all about. Organisms have a time dimension, ontological, but above all historical: phylogenetic, evolutionary. Additionally, there is the dimension of relationships not only in time (hereditary material and how to use it), but as well in space (spatial conformation of DNA, interrelations as e.g. DNA-RNA, RNA-protein, protein-protein, etc.). Living world has a character of a network, it is a web of interactions, and it is always exactly their **setting**, what tell us about "core" properties of such biological entities – *far enough from just knowing the structure* of elements. Again, what counts, and maybe first of all, is the setting, i.e. *relationships* between particular elements of such network. Hence, biology can be defined as a science about specific interactions on all possible levels of organization of "living matter". Symbiosis concept, as a formal description of such relationships, is then the most appropriate basis for how to explain them and how to put them in a coherent system of knowledge.

As a conclusion, the phenomenon of symbiosis is absolutely crucial for the current theoretical biology, areas of its interest should be the explaining the realm of living world from unifying perspective outlined from all the data available in numerous biological disciplines, which are otherwise *a priori* separated by interdisciplinary barriers; that all for trying to come up with unexpected relationships, quantify them using all the possible tools, and makes specific predictions for further research with feedbacks back to the basic research.

Symbolically, the symbiosis concept seems to show the trinity of facets, each of which results from the previous, each from which is autonomous in its own way, but only together are in fact in their wholeness. And it is this wholeness of one universal principle, which we can model due to our long-standing biological experiences with phenomenon of interactions in realm of science of life, i.e. with concept of symbiosis. I suppose that this new approach has the explanatory power for advances in such biological tasks such as more accurate definition of life (the exhaustive one is still missing in biology, after centuries) or re-definition of biological "individual" (see in text above) as well as re-definition of biological species, inter alia. Moreover, and this is worth attention, it is possible to put biology as well as humanities on *this* theoretical basis, because no matter what kind of elements we have (amino acids, proteins, tissues, individuals, herds, ecosystems, ideas, languages...), but rather what kind of inter-linking we have, i.e. what kind of context, what kind of meaning – "patterns that connect" in words of Gregory Bateson (Bateson 2002; Goodwin 2010). In this sense, the phenomenon of symbiosis is the true missing link in biology.

At least, this topic deserves further research.

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Primary Paper Section: E

Secondary Paper Section: H

I INFORMATICS

IN INFORMATICS

TARGET BRAKING OF UNDERGROUND TRAINS DRIVEN BY AN AC AND A DC MOTOR

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Abstract: Target braking of underground trains as a function of an Automatic Train Operation ATO system has been described in this paper. A general model of target braking regulator has been shown. A quality indicator of automatic train braking process was discussed. The functionality of SOP-2 system used in the Warsaw underground was presented. The rolling stock powered by an AC and DC motor has been taken into consideration. Further research plans of target braking in Simulink have been explained.

Keywords: automatic train operation system, target braking, railway traffic control, subway, control modeling.

1 Introduction

Traffic conditions present in the underground are unique in that the distance between trains is short, they move with high speed (V~90 km/h) as well as platforms are short. Therefore, it is required to apply specialized systems which can provide traffic safety, which in terms of speed restrictions, is ensured by Automatic Train Protection (*ATP*) system. Once the system has been provided with appropriate data it can calculate safety speed for each train or all trains travelling along the same line. By executing a specified algorithm *ATP* devices do not allow to exceed safety speed as it includes control of the power transmission and braking system. The system protects against dangerous situations such as collision with the preceding train, failed braking before absolute stop, falling out on curve due to excessive speed, etc. The *ATP* system is initiated only if the driver exceeds permissible speed e.g. signalled by a semaphore [4, 6]. Automatic Train Operation (*ATO*) is another example of systems which can be of help in the underground. This one is responsible for supporting the driver of the train. Both systems can cooperate and in this case *ATP* is a master system while *ATO* is relative. The following functions can be implemented by an ATO system:

- Automatic train starting, riding and stopping,
- target braking,
- train doors opening/closing,
- driving for energy savings
- driving for schedule optimization.

Target braking is one of the most important functions performed by an *ATO* system. It relies on automatic train stopping at the stations, where braking process is fully controlled by a microprocessor device. Target braking helps to avoid dangerous situations due to stopping too far from the passenger transfer section of the platform. For instance it prevents from a serious injury when a passenger would fall into the gap between the platform and the train. Further the position where the train stops is very important at stations equipped with double-locked doors (so-called closed platforms). In this case it is required to stop the train according to the method "door to door". Precise stopping also affects the evacuation of passengers in the event of a terrorist attack [1, 5].

2. Target braking

2.1 General method of target braking

Target braking is a special case of essential train braking. It consist of progressive reduction of actual train speed V_{rz} to the permissible speed value V_d=0. The permissible speed has to be obtained at the stage of speed restriction x_d. During this process the permissible value of deceleration a_h cannot be exceeded. Automatic braking process occurs in the following situations:

- On the platform, where the train stopping has to be accurate and the actual train stopping position x_{rz} fulfils the condition of $x_{rz} = x_d \pm c$,
- by the semaphore, where the actual train stopping position is donated by $x_{rz} \pm c \le x_d$,

where c – admissible stopping tolerance.

Target braking is an important stage of underground train ride as it is required to stop a train in a platform with limited length. The average length of the subway train is about 100 m, length of the platform for reasons of space savings in the tunnel is very similar [1]. The process of target braking consist of two phases: motor braking phase (electrodynamic braking) and mechanical braking phase (performed by a pneumatic brake). The second stage of braking is required because of decreasing capacity of the electrodynamic braking at low speeds. Target braking process is executed by a proper control of electric motors. However, the process is more complex than it appears. Target braking operation requires solving two problems such as [1]:

- Firstly, the braking has to be initiated in appropriate distance from the stopping point.
- Secondly, the braking process has to be properly conducted.

2.2 Structure of the braking control system

The primary task of a brake control system is to obtain in the point of speed restriction x_d, permissible speed V_d with certain restrictions. To conduct this process the following data have to be obtained:

- Constant parameters: capacity of electrodynamic and mechanical braking, coordinates of the stopping points, vertical and horizontal line profile.
- Variable parameters: actual train speed V_{rz}, actual train stopping position x_{rz}, permissible speed V_d, train load and any external interferences z.

The executing system has to perform the following tasks (in the given order):

1) determine x_0 point for starting the braking process,
2) determine the actual train position x_{rz} and begin to measure the actual train speed V_{rz},
3) calculate the braking speed V_h,
4) calculate in real time the braking force F_h and control the braking process.

The steps from enumeration *1-3* are measurement and compute operations. Therefore, these steps are not affected by the integrated train braking system. The above-mentioned actions in no. *4* have a control-execution nature and are related to the integrated braking system [1]. The structure of this system is shown in Fig. 1.

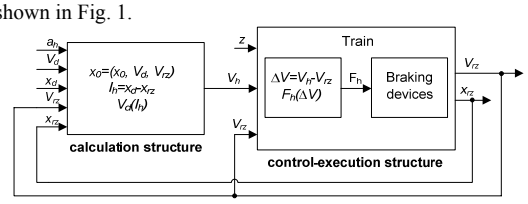

Fig.1. Structure of the automatic braking system [1]

The above-mentioned calculation structure consists of the following tasks:

a) to determine initial braking point x_0,
b) to calculate the distance l_h – between the front of the train x_{rz} and the point of speed restriction x_d,
c) to generate the theoretical braking curve $V_h(l_h)$.

The tasks of the control-execution structure are as follows:

a) Calculation of the difference ΔV between braking speed V_h and the actual train speed V_{rz},
b) determination of the braking force F_h and execution of the braking process (electrodynamic and mechanical).

Braking devices are implementing the braking process with a specified value of braking deceleration a_h. The braking control

system cooperates with motor and pneumatic control circuits for the proper train stoppage. To provide optimal braking quality it is required to perform three optimum controlling phases [1]:

I. The phase of progressive accumulation of braking deceleration to maximal value.
II. The phase of braking with maximal delay.
III. The phase of progressive decrease of braking deceleration to a zero value.

2.3 Quality of the braking process

Evaluation of the braking quality takes into account static (Δ_d) and dynamic (Δ_v, Δ_a) parameters:

- static: accuracy of train stopping,
- dynamic: accuracy of braking control process and execution of the theoretical braking curve $V_h(l_h)$.

The quality of braking process indicator allows to assess the value computationally [1]:

$$I_r = \alpha \cdot \Delta_d + \beta \cdot \Delta_V + \gamma \cdot \Delta_a \quad (1)$$

where:

$$\Delta_d = \left| x_{rz}(t_k) - x_g \right| \quad (2)$$

$$\Delta_V = \int_{t_0}^{t_k} (V_h - V_{rz})^2 dt \quad (3)$$

$$\Delta_a = \int_{t_0}^{t_k} (a_h - a_{rz})^2 dt \quad (4)$$

α, β, γ – constant importance factors of the quality indicator components.

3. Solutions of target braking in the Warsaw underground

3.1 The no. I underground line in Warsaw

On the 1st line of Warsaw underground, traffic safety provides a system commercially called SOP-2. It is a type of an ATP system which is enriched in ATO system function – the target braking of train in the platform. The SOP-2 performs its tasks by a continuous data transmission, which is achieved by using a wire loop placed between the track [2, 3]. There are used two basic types of rolling stock: Russian series 81 trains driven by a DC motor and Alstom Metropolis trains powered by an AC motor.

3.2 Rolling stock driven by a serial DC motor with a resistance start-up

The initiation of the target braking process is fixed in software. The whole process consist of uploading four characteristics of the distance from the stopping point, to the vehicle microcomputer memory (Fig. 2).

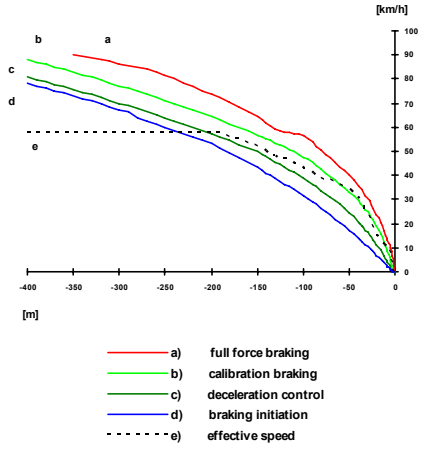

Fig.2. Speed curves controlled during target braking of train 81 type [2]

After crossing the braking initiation curve (***d***) the braking process is initiated. Braking takes place according to the course of the calibration braking curve (***b***), which was designated during a man-braking . The full braking force (***a***) and deceleration control (***c***) curves are responsible for the proper execution of target braking. The underground line is divided into a certain number of spacing blocks, which have been assigned with unique sequence numbers. The wired loops lengths are identical to the spacing blocks. In the area of the stations all spacing blocks are the same. The main idea of braking is based on the comparison of the coordinates of actual train position with the coordinates of the inscribed braking characteristics in the form of curves. The calculated difference has an impact on the controlling signals. Coordinates of the measured route from the stopping point are obtained from the number of a spacing block. The current train position and the real speed value is also measured by a tachometer, thereby the actual distance from the stopping point can be counted [2].

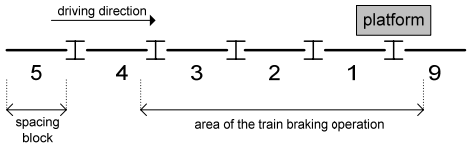

Fig.3. Numbering of track sections [2]

When the train approaches the no. 3 spacing block area (Fig. 3), the system counter is positioned approximately with a constant value of the distance remaining to the stopping point. Next, the measured value of the actual driven distance is subtracted. In the region of spacing block no. 2, 1, 9 similar calculations are made. Final adjustment occurs 50 metres before the stopping point due to a wire loop crossing. Series 81st trains normal braking can be divided into three stages. The first stage concerns braking with maximum resistance of the braking resistor and smooth adjustment of motor coil excitation (48%÷100%). The second stage involves a camshaft operation, which relies on reducing the value of resistance in the braking structure. Electrodynamic braking becomes ineffective below the value of 10 km/h; therefore, in the third stage the train is stopped with the use of pneumatic brakes. The target braking force is controlled by the influence of camshafts on the control circuits. Camshafts controlling circuits are coupled with the current adjustment block. When the voltage of camshafts circuits is disabled, in the first stage during regulation of motor coil excitation the current considerably decreases. In the second stage a voltage interrupt holds the camshafts in place and the current decreases gradually to a very small value. Renewed movement of the shaft ensures emerged control voltage. The camshaft achieves subsequent adjustments every 0.16 seconds – the brake control current increases progressively. Proper control of camshafts duration times enables the realization of the calibration braking curve [2].

3.3 Rolling stock driven by an AC motor

Operation of the target braking structure can be divided into several phases presented in the Fig. 4. The braking route consist of tracking the reference braking curve (Fig. 5), while electrodynamic braking takes place and driving trough the access road (with the impetus and next pneumatic braking).

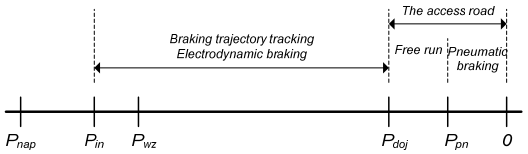

Fig.4. Characteristic points of target braking process [2, 3]

Explanation of the Figure 4:
P_{nap} – traction drives disabling,
P_{in} – regulator initiation,
P_{wz} – start of tracking the calibrated braking trajectory,
P_{doj} – end of tracking the calibrated braking trajectory (the regulator disabling),
P_{pn} – pneumatic brakes start.

If the train crossess the appropriate wire loop, the braking process will be initiated. The road and the speed are measured. Respective braking commands are given as a result of comparison of the actual distance and the calibration curve distance from the stopping point. After crossing the drive-off curve the drive is turned off and the braking procedure starts. The drive-off curve is calculated continuously by the braking force controller and it is based on the reference braking curve. At point Pnap the drive is turned off. At Pin the braking force controller starts to work, however, due to a delayed action of the controller the trajectory tracking begins at Pwz point. At Pdoj the train has to achieve a speed of 10 km/h, also the electrodynamic braking is turned off and the trajectory tracking is finished. Afterwards the train rolls free and the precise train stopping is now based on the pneumatic braking characteristic. At point Ppn pneumatic brakes are being activated. The pneumatic braking force operates with a constant value until the train is stopped. The control of driving and braking processes is performed by the operating current. The SOP-2 units are connected with the train controlling circuits. Electrodynamic braking is the basic type of braking and takes place according to the braking force reference characteristic (Fig. 6). During the braking process the current varies from 4 mA to 20 mA. This corresponds to the braking deceleration from 0 m/s2 to 1,3 m/s2. The current control ensures a smooth control of the deceleration [2, 3].

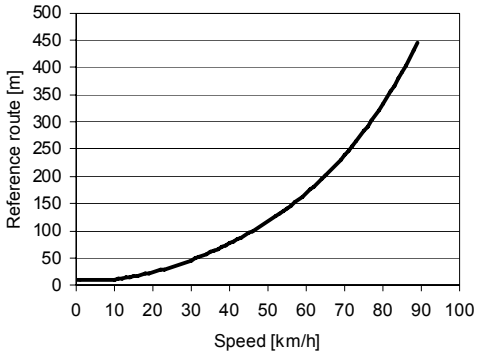

Fig. 5. Reference braking curve [2]

The train is braking with a delay calculated in the system or predetermined by the driver. The system is designed to select always a higher value of deceleration. With an output current loop a 8-bit control current signal is transmitted to the encoder. In two additional input current loops, the current signals are changed into voltage. The first is equivalent to the system deceleration value, while the second to the deceleration predetermined by the driver [2, 3].

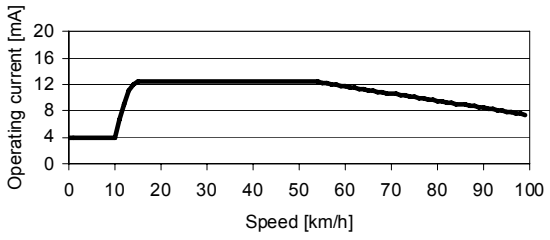

Fig. 6. Braking force reference characteristic [2]

3.4 Simulation studies

It is necessary to investigate the influence of drives on the target braking accuracy. For this purpose a simulation model is being formed. The simulation model takes into account ride and control dynamics, train physics, line profiles etc. The AC drive model includes a PID regulator. For a DC drive with a resistance riot, start-up resistances have to be taken into consideration. A functional simulation model has been proposed (Fig. 7). It consist of train structure, controller block and braking initiation layout. Train dynamics and physics are presented by the motor characteristics (Ms, Mh), parameters of braking system (ah – retardation capability), start-up resistances characteristics (Rh) and train weight. Braking initiation block decides about drive disabling and initiation of the braking process (Fh, Fn). For this purpose a braking characteristic s(V) is needed. The line parameters are represented by speed V(s) and route s blocks. The regulator maintains the braking force according to a s(V) characteristic and the train parameters. Finally braking accuracy is being calculated as the distance between the adopted and the actual stopping point.

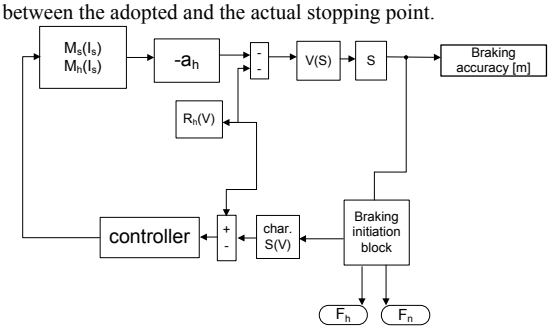

Fig.7. Target braking simulations – a functional model of a DC drive with a resistance start-up

4. Conclusions

The solutions of target braking described in this paper provide the accuracy of braking in the range of ±0,5 to ±1,5 meters for Series 81st trains and in the range of ±0,3 to ±0,5 meters for Alstom Metropolis trains. Braking solutions discussed here are dedicated only to the beforehand mentioned types of trains. It is assumed that the quality and accuracy of target braking depends on the performed traction drive control. Furthermore, the phase of mechanical braking does not affect accuracy of target braking. Target braking process has to be carried out in the manner below:

- Rapid deceleration changes causes jerks which are negatively perceived by the passengers e.g. passengers are falling down,
- as short as possible, braking in a long time causes a decrease in commercial speed.

Currently undertaken studies deals with the examination of traction drives influence on the quality of target braking. For this purpose a SIMULINK model is being prepared.

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Primary Paper Section: I

Secondary Paper Section: JB, JO, JT

CREDIT EXPERT – EXPERT SYSTEM FOR CREDIT APPLICATIONS EVALUATION

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Abstract: In today's world there are a lot of examples of collaborations between information technology and economics. However, there are still some importatnt areas of economy, in which contribution of modern technologies is too small. Author has decided to focus on the credit scoring evaluation process management. The main goal of the author's study was to develop the computer tool to support management of credit applications evaluation process, using artificial intelligence techniques. To achieve this purpose, author has decided to build an expert system – CreditExpert. This paper describes the credit scoring phenomenon, shows how to build good scorecard, and then carries the reader step by step through the whole process of developing the expert system.

Keywords: expert systems, artificial intelligence, credit decision, credit scoring, credit.

1 Introduction

Due to the rapid development of technology, especially information technology, which can be seen in past few years, many areas of science are able to explore the entirely new, undiscovered cognitive opportunities. One of such areas is economy, which is currently using, at almost every step, the latest achievements of modern technology. Cooperation of these two disciplines of science made it possible to better know, understand and facilitiate the management of economic processes.
However, there are still some important areas of economy, in which contribution of modern technologies is too small. Author has decided to focus on the credit scoring evaluation process management. This process is crucial in today's world. Moreover, it is hard to imagine the world without banks, credits or credit cards. People all over the world are almost addicted to them and need them in life nearly as much as oxygen.
Nowadays, the credit scoring evaluation process depends on human experts, who are responsible for evaluation of the credit applications and making decision to accept or to reject it. The problem appears, when there is lack of such human experts on the labor market. Another thing is that the assessment made by human expert could be subjective to some extent. He may also commit some mistakes due to fatigue, stress or other negative factors. One of the solutions for this problem is automation of the credit scoring evaluation process, by developing computer expert system, which could eliminate the necessity of human expert participation in this process.
The main goal of the author's study was to develop the computer tool to support management of credit applications evaluation process, using artificial intelligence techniques. To achieve this purpose, author has decided to build an expert system - CreditExpert.

2 Credit Scoring

2.1 What is Credit Scoring?

There are a lot of definitions of credit scoring in literature. However, author has chosen two of them, which seems to capture the whole essence of this phenomenon. The first one has been proposed by Anderson, who in very simple words states this term as:

"…the use of statistical models to transform relevant data into numerical measures that guide credit decisions."[1]

The second one, which has been stated by Thomas, Edelman and Crook in their "Credit Scoring and Its Applications", and according to them:

"Credit scoring is the set of decision models and their underlying techniques that aid lenders in the granting of consumer credit. These techniques decide who will get credit, how much credit they should get, and what operational strategies will enhance the profitability of the borrowers to the lenders."[3]

2.2 Scorecard Development Process

One of the most important things in the credit scoring process is the scorecard development. According to E. Mays:

"A scorecard is a system for assigning points to borrower characteristics in order to derive a numeric value that reflects how likely a borrower is relative to other individuals to experience some event or perform some action."[2]

The process of developing the scorecard is very complex and consists of six main stages: Project preparation, Data preparation, Scorecard modeling, Finalization, Decision-making and strategy, Security. The simplified development process is presented in figure 1.

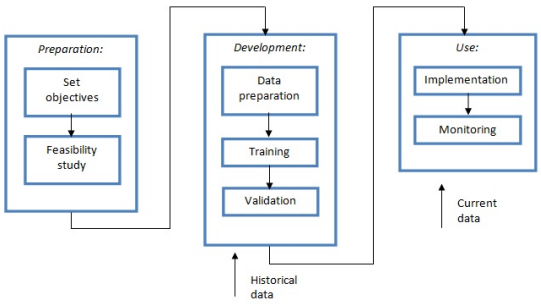

Figure 1 Scorecard Development Process.
Source: [1]

3 Building the Credit Scoring Expert System

The main goal of the author's study was to develop the computer tool to support management of credit applications evaluation process, using artificial intelligence techniques. For this purpose, author has decided to build an expert system – CreditExpert. Development process of the system has been managed by the author on the basis of scorecard development process.

3.1 Project Preparation

Preparation for developing CreditExpert system mainly refers to setting objectives and feasibility study. Author has planned functionality of the system precisely. According to his assumptions, CreditExpert has to be able to:

- evaluate the credit application and decide if it should be Accepted, Rejected or Consulted with the superior,
- save the solution of evaluation to the database,
- evaluate customer's profile,
- evaluate customer's financial situation,
- evaluate credit guarantees,
- browse the database with solutions.

Feasibility study has shown that there are no contraindications to develop the system. Implementation has been dependent on the minimal requirements of AITECH Sphinx package [5], which author has decided to use to build his system, and availability of MS Access Database. Fortunately, minimal requirements of the Sphinx package can be fulfilled by PC with a clock rate of only 486 MHz processor and 8Mb RAM, using Windows 98 operating system or newer. And MS Access Database is one of the components of the well-known and widely used MS Office package.

3.2 Data Preparation and Scorecard Modeling

CreditExpert, expert system for credit application evaluation, consists of one knowledge base and four knowledge sources, which include 312 rules. Rules have been built with the help of the expert from the field of banking and credits, who is responsible for judging if the customer's application should be accepted or rejected in every day work. Moreover, during the building of the system, author had the opportunity to observe and analise the module of the system developed for one of the Polish commercial banks in Microsoft Excel environment, which is in use in daily work in this bank.
Author has decided that credit decision depends on 3 main factors: customer's profile, financial situation and credit guarantees. These main factors depends on another smaller factors. Dependencies diagram is shown in figure 2.

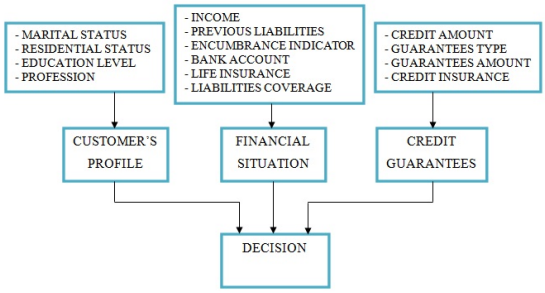

Figure 2 Dependencies Diagram.
Source: Own Study.

Credit Expert system consists of 4 knowledge sources: *Decision.zw*, *Guarantees.zw*, *Finance.zw* and *Profile.zw*.
Decision.zw knowledge source, assesses the credit application on the basis of customer's profile, guarantees and financial situation. Decision could be defined as one of three values: to reject, to accept or to consult the decision with the superior. Before developing CreditExpert system, author has made some assumptions relating to rules coded in knowledge sources. In case of making credit decision, the main assumption is that the bank does not grant the credit to customers with bad financial situation, bad guarantees or sufficient financial situation and bad profile. In other cases, in which the financial situation is only sufficient or the customer's profile is bad, the final decision should be consulted with the superior, because there is a high risk for the bank and customer may be asked to submit the additional credit guarantees, which would decrease the level of risk. In other situations, the decision should be to accept the credit application. The example of rule from *Decision.zw* knowledge source is presented below.

```
16:     decision = "Consult" if
        guarantees = "Very Good",
        finance = "Sufficient",
        profile = "Very Good";
```

As it has been mentioned before, credit decision depends on three factors. The basic condition for receiving the credit is to provide adequate guarantees for the bank. Most banks would like to receive the guarantees, which cover the amount of credit at least twice. Credit guarantees are defined in the *Guarantees.zw* knowledge source. They could be assessed as 'Bad', 'Good' or 'Very Good'. The value of guarantees depends on the credit amount, guaratees type, level of coverage of the credit amount by the guarantees and credit insurance.

```
53:     guarantees = "Bad" if
        credit_amount = "50 000 - 100 000 PLN",
        guarantees_amount = "< 1",
        insurance = "No";
```

The next condition for receiving credit is stable financial situation of the customer. This factor is defined in the *Finance.zw* knowledge source. Customer's financial situation could be assessed as 'Bad', 'Sufficient', 'Good' or 'Very Good', depending on his monthly income, previous liabilities payment, encumbrance indicator, level of liabilities coverage and facts if the customer has the bank account and life insurance.

```
154:    finance = "Good" if
        income = "> 5000 PLN",
        previous_liabilities = "Yes",
        encumbrance_indicator = "50 - 55%",
        account = "No",
        life_insurance = "Yes",
        liabilities_coverage = "Yes";
```

The last condition, which influences the credit decision is customer's profile. It is described in *Profile.zw* knowledge source. Customer's profile could be assessed as one of three values: 'Bad', 'Good' or 'Very Good'. The assessment basis on the answers for couple of questions concerning customer's marital status, residential status, profession and education.

```
224:    profile = "Very Good" if
        marital_status = "Married",
        residential_status = "Flat Ownership /
                             House Ownership",
        profession = "Own Business",
        education = "Secondary";
```

3.3 Finalization – CreditExpert Knowledge Base Coding

All of knowledge sources, which have been previously described are used by the *CreditExpert.bw* knowledge base. Knowledge base is the main program file, which defines the whole program, its menu and functionality. It is build from 2 main blocks – sources block and control block. The sources block is responsible for definition of all of the knowledge sources used by the knowledge base. While control block determines the main program and all of its functions.
After running the application, its vignette appears and user is asked to log into the system.

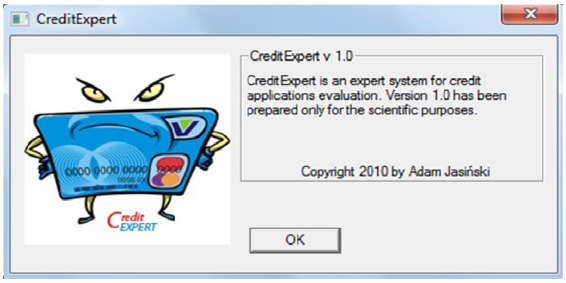

Figure 3 Vignette From the CreditExpert System.
Source: Own Study.

If the log in procedure is successful, user sees the main menu and can choose system's option he is interested in. In this paper we will focus only on the main option of the system – Credit Application Evaluation.
After choosing this option, the questionnaire appears on the screen and user has to fill the information about credit (credit amount, crediting period, total amount of guarantees), financial situation (average income, monthly liabilities) and personal data (name, surname, pesel number). On the basis of this information system adds new facts, which are necessary in guarantees and financial situation assessments.

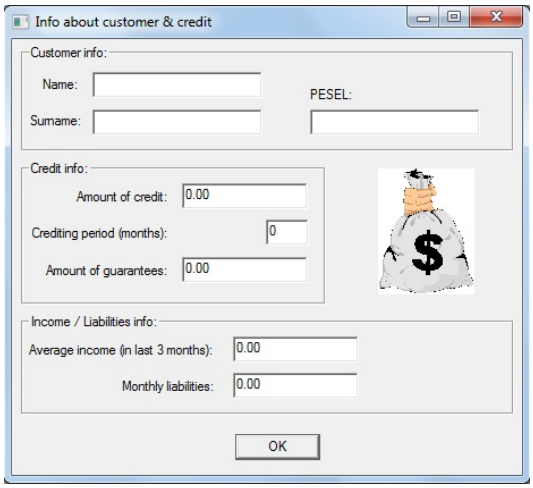

Figure 4 Questionnaire From CreditExpert System
Source: Own Study.

Then CreditExpert asks a few questions to user and performs the evaluation of customer's profile, financial situation and guarantees, which lead to the final, credit application evaluation.

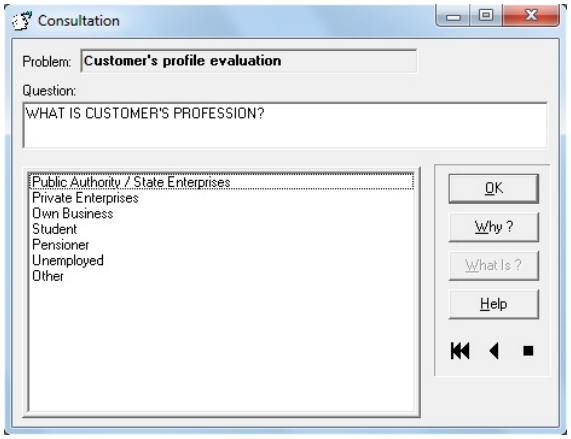

Figure 5 Example of Question Asked by CreditExpert System..
Source: Own Study.

After answering for all of the questions in consultation, system displays the solution and connects with the MS AccessDatabase – *CreditExpert.mdb*, where using sql statements the solution is saved.

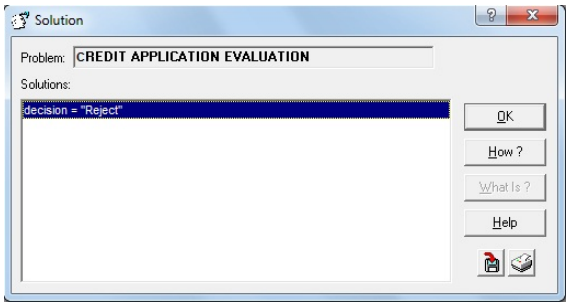

Figure 6 Decision Made by CreditExpert System.
Source: Own Study.

3.4 Validation

The purpose of the validation stage is to ensure the developer that the system will be working well in practice. To validate the CreditExpert system, author has made some research. 100 credit applications have been analyzed by the CreditExpert and by the expert from bank simultaneously. Both types of consultations have been performed on the same, sample data.
It is assumed that expert system's quality is on satisfactory level, when system can resolve over 75% of cases, and the number of errors does not exceed 5%. [4]
CreditExpert has been able to resolve 81% of cases, while 19% of cases have required the consultation with human expert. Only these 81% could be used in comparison of results between CreditExpert expert system and human expert evaluations. From this 81 cases, CreditExpert system has made only 4 mistakes – 3 applications, which have been accepted by expert system, has been rejected by human expert, and 1 application, which has been rejected by CreditExpert should be accepted.

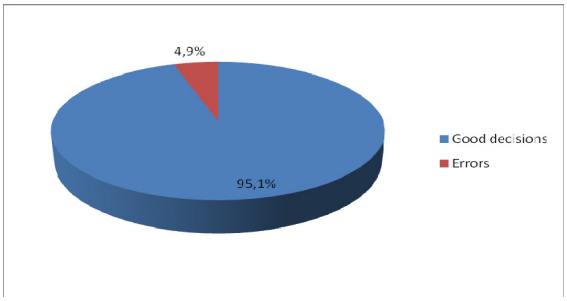

Figure 7 Percentage of Good Decisions and Errors Generated by CreditExpert System.
Source: Own Study.

After validation, CreditExpert system is ready to be implemented and used in everyday work in bank. Despite of this fact, it is important to remember that development process is not finished. The last step is ongoing monitoring.

4 Summary and Conclusions

The main goal of the author's study was to develop the computer tool to support management of credit applications evaluation process, using artificial intelligence techniques. To achieve this purpose, author has decided to build an expert system – CreditExpert, which should be able to replace or to decrease the role of human experts in credit application evaluation process.
On the basis of the research results (validation stage), it can be stated that CreditExpert system can be effectively used in financial institutions and for sure it will support and facilitiate the management of the credit scoring evaluation process. However, author realizes that his system is not free of defects or weaknesses. He thinks that this version of CreditExpert cannot eliminate human experts from the credit application evaluation process at all. He assumes that the version 1.0 of CreditExpert could be rather used by customers before applying for a credit in bank, instead of using it for making final credit decisions.
In the future versions of the system, author will try to increase system's efficiency and to decrease a number of its mistakes. His purpose will be to improve CreditExpert in such way that it will be able to resolve 100% of cases and to eliminate the participation of human expert in a process of credit applications evaluation.
In a few years, systems basing on artificial intelligence technology, including expert systems, will be used all over the world, in almost every area of business. They will enable automation of different business processes, which will facilitate the work of enterprises and will reduce unnecessary risk of making mistakes. As a final conclusion, it has to be said that it is worth to invest in modern technologies, because they allow rapid development of enterprises and being competitive in today's highly demanding market.

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Primary Paper Section: I

Secondary Paper Section: AE, AH, IN, JC

PROCESSING OF ASTRONOMICAL IMAGES USING MATLAB IMAGE PROCESSING TOOLBOX

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The work has been supported by the grant of The University of West Bohemia: "Intelligent methods of machine vision and understanding", Project No. SGS-2010-054.

Abstract: The paper deals with searching for meteors in digital astronomical images. Hough transformation for searching for straight lines was used. Four functions were created on the basis of this method for various types of meteoric snaps. Graphic User Interface (GUI) for handling of functions and the database of snaps was created on the basis of MATLAB. MATLAB tool Image Processing Toolbox was used for image processing as well.

Keywords: meteor detection, Hough transformation, graphic user interface, MATLAB, Image Processing Toolbox

1 Introduction Into Processing of Astronomical Snaps

Astronomical records can be divided into some different groups. We can distinguish static and dynamic records, classical analogue or digital records, professional and amateur astronomical snaps, and of course, astronomical records can be divided by their contents. This work is aimed at processing and analysis of static digital meteoric snaps. The task was to search for meteors in meteoric snaps.

1.1 Hough Transformation

Meteors in astronomical snaps usually have a typical straight-line shape. Hough transformation is the most current method for searching for straight lines in digital images. The principle of Hough transformation for straight lines detection will be explained using the straight line with slope-intercept form. A straight line is defined by two points: $A = (x_1, y_1)$, $B = (x_2, y_2)$, see Figure 1. Slope-intercept forms for straight lines going through the points A and B are given by the equations:

$$y_1 = kx_1 + q \quad (1),$$
$$y_2 = kx_2 + q \quad (2),$$

when k, q are parameters. These equations are interpreted in the parametric space for parameters k, q:

$$q = -kx_1 + y_1 \quad (3),$$
$$q = -kx_2 + y_2 \quad (4).$$

The straight lines given by the equations (1) and (2) in the Cartesian coordinated system are given by the equations (3) and (4) in the parametric space. The only common point of both straight lines in the parametric space is the point, which represents the only existing straight line connecting points A and B in the original image space. It is the main principle of Hough transformation for searching for straight lines that all straight lines and their parts in the image space are transformed into the only points in the parametric space.

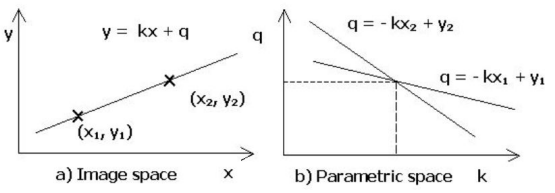

Figure 1 Principle of Hough transformation

All image points are transformed into some points in the parametric space. All values in the parametric space are quantized and the parametric space is divided into elementary cells. Points, which belong to the elements of the straight lines, are accumulated in these cells. At the end of this process the contents of all cells are evaluated. If some cell contains numerous points, it is a big probability that these points lie on the same line. Main steps of the Hough transformation are shown in Figure 2. Edge detector is usually used as a pre-processing method before Hough transformation. We can see an original image (a), edge image (b), parametric space (c), and detected lines (d).

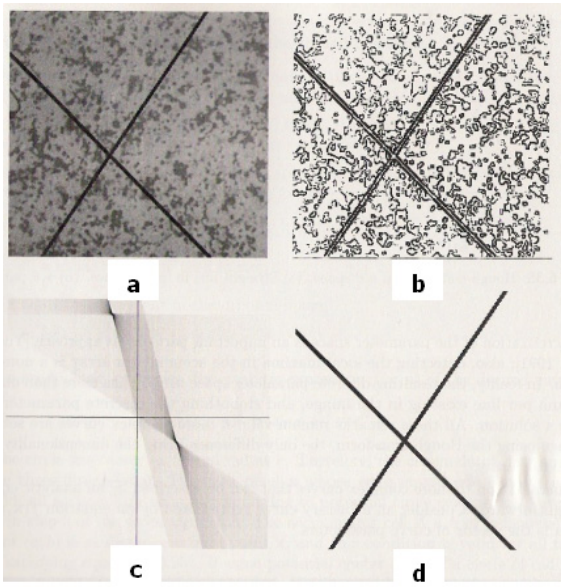

Figure 2 Main steps of Hough transformation by [1]

1.2 Functions for Meteor Searching

Four functions were created to search for meteors in meteoric snaps. It was basic meteoric function, function using median smoothing, function with image rotation, and combined filtration and rotation function. The MATLAB tool Image Processing Toolbox [3] contains many functions to process digital images. Image Processing Toolbox functions were used to create new functions for meteor searching. Detailed description of Image Processing Toolbox functions and new created meteor functions was brought in the paper [2]. We can briefly summarize that main Image Processing Toolbox functions used in meteor searching are the followings: greyscale transformations, geometric transformations, image smoothing (especially median filtering), and edge detector. These functions are further briefly described.

Greyscale transformations are processes, which do not depend on the position of the pixel in the image. Greyscale transformation functions transform the original image with the given brightness into an image with a new brightness. Geometric transformations realize basic geometric operations with the image: rotation, change of the scale and skewing by the angle. Image smoothing is an image pre-processing method, which is used to suppressing of noise in the image. Image smoothing methods, which are not edge preserving, blur sharp edges, which causes lost of information. Median filtering is a non-linear smoothing method that reduces the blurring of edges. The current image point is replaced by the median of the brightnesses in its neighbourhood. Edge detector is a general tool for finding of lines in the image. MATLAB uses edge detector, which is based on the local convolution in the image with convolution kernels, which serve as line patterns. It is used as a line finding operator. All described functions were used in new created functions. The particular realizations of these functions are implemented by the user menu for meteor searching, which is described in the chapter 2.

2 Graphic User Interface for Meteor Searching

The process of meteor searching itself is realized by the Graphic User Interface (GUI), which was created on the basis of the

MATLAB GUI. This tool enables to build an interactive user menu, in which it is possible to insert functions, data, and databases. It is possible to separate two main steps in the user menu building. First step is the choice of buttons from starting menu; see Figure 3. Second step is programming of user functions and creation of the linkage between these functions. Property Inspector serves for setting of technical parameters as a size, fonts, colours, position, etc. Programming of the menu functions, which belong to the buttons, sliders, and other menu items, is realized in M-file Editor (Figure 3). Resulting menu, which was built to search for meteors in meteoric snaps, is in Figure 4. This menu contains push buttons to call meteor functions, pop-up menus to look through the databases of processed images, list box to choose meteoric snap to process, and list box to look over results of the searching. The push button for insertion of a new image to process is placed in the menu as well. It is possible to monitor the whole process of searching for every single meteor, because partial results of meteor detection process are available.

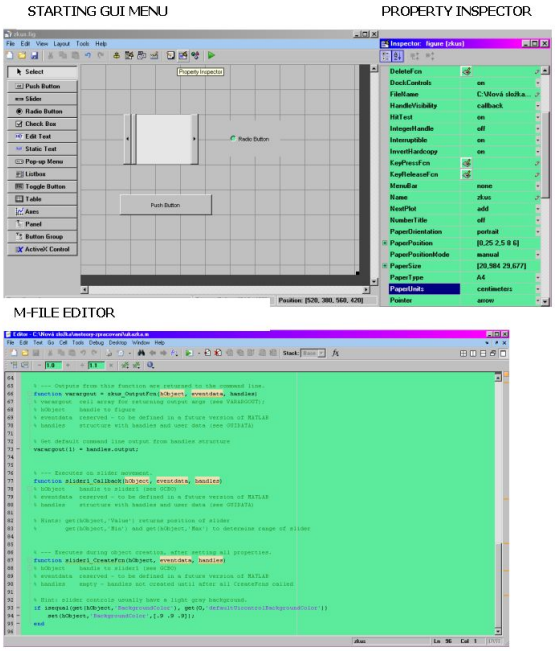

Figure 3 Building of the menu on the basis of MATLAB GUI

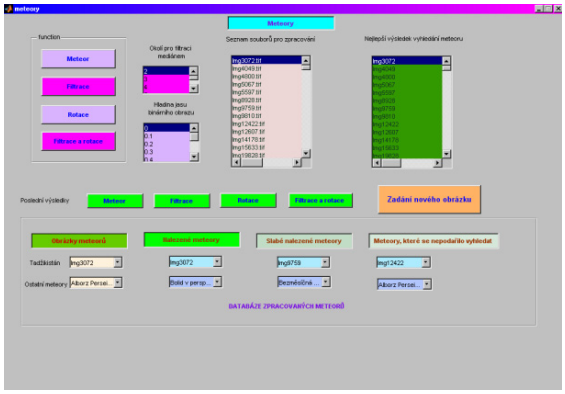

Figure 4 Menu for meteor searching

3 Results of Meteor Searching

This chapter describes some typical results of meteor searching. All used functions are realized on the basis of Hough transformation. The basic meteoric function is based only on this method. Very bright meteors were successfully found using the basic meteor function. But numerous meteoric images do not contain very bright meteors. The main problems, which arose during searching for meteors, are the followings: feeble meteor on the background with bright stars, meteor on the day sky with the Sun, false lines in the image, earthly objects as buildings, trees, cars, mountains, various pylons. Satellites on the night sky represent a big problem as well. Special case is a very bright meteor named bolid, or fireball, which often has not a typical straight-line shape. These meteors could not be to search for by Hough transformation. A few snaps with meteor showers were processed as well, but processing of snaps with meteor showers was not the goal of this work. It is a more complicated problem demanding different methods. The most common types of meteors were successfully found using combination of basic meteor functions with median filtering or image rotation. The typical meteoric snap and result of the search for meteor is shown in Figure 5.

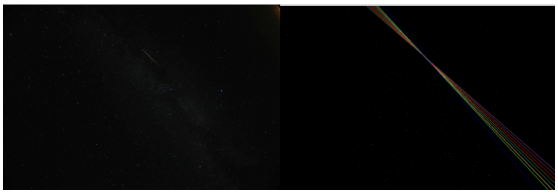

Figure 5 Example of detected meteor

4 Conclusions

Two hundred meteoric snaps were processed using described functions and created menu. Almost 80% of meteors were successfully found. The main problems mentioned above require new methods of searching for meteors. Improving of the user menu is necessary as well. The next step in meteor searching, after solution of current problems, is to automatize the meteor searching process.

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Primary Paper Section: I

Secondary Paper Section: BN

ANALYTICAL MODEL OF QOS MECHANISM – PRIORITY QUEUING USING MARKOV'S CHAINS

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Abstract: This paper describes the creation of an analytical model for QoS mechanism - Priority Queuing in a system with two queues. Into the queues arrive two independent streams of packets. The described model is designed to calculate a packet delay (a response time) which is one of the key QoS parameters. For this purpose, theory of Markov's chains is used.

Keywords: Quality of Service, QoS, response time, analytical model, Markov's chain, packet, transition graph, exponential distribution, generating function

1 Mechanism Priority Queuing

Priority queuing (PQ) is one of the congestion management tools. They allow controlling congestion by determining the order in which packets are sent out through an interface based on priorities assigned to those packets. The congestion management tools entail the creation of queues, assignment of packets to those queues based on the classification of the packet and the scheduling of the packets in a queue for the transmission. In PQ, one service class of packets is assigned to each queue with specific priority. The priority of particular queues is different. Within each of queues, packets are scheduled in FIFO order. First packet is taken from queue into transmitter and then it is sent bit by bit through output port. The queue with the highest priority is served first until it is empty. Then, the lower priority queues are served according to their priority. In other words, packet is taken from the queue, only if all queues with higher priority are empty. This procedure is repeated every time a packet is sent. A rate of sent packets from transmitter is given by bandwidth of output port.

2 Analytical model of Priority Queuing

Mechanism PQ can be modeled using different ways, similarly as other QoS mechanisms. This section show, how Markov's chains can be used for this purpose. For the sake of simplicity, model with only two infinite queues is assumed here. The goal is to find the *mean response time* for packets of priority queue. It is important performance measure.

2.1 Basic terms

Necessary conditions for using Markov's chains are *Poisson* distribution of packet arrivals and *exponential* distribution for service time. Thus if $A(x)$ denotes the number of packets that arrive during any time interval into the k-th queues of length x, the Poisson distribution of packet arrivals is given by

$$Pr[A(x)=n]=\frac{(\lambda_k x)^n}{n!}e^{-\lambda_k x} \quad (1)$$

Parameter λ_k is *intensity* of packet arrivals into the k-th queue and is measured in packet per second. Compared to original, packets are not transmitted bit by bit but as a whole. Time of packet in transmitter (interval between selection packets to transmitter and his transmission on output port) is given by packet size and it is called *service time*. It has the exponential distribution for Markov's system. Thus service time for packets of k-th queue I_k with mean $1/\mu_k$ is given by

$$Pr[I_k \le x]=1-e^{-\mu_k x} \quad (2)$$

where μ_k is *service intensity* for packets of k-th queue. The mean service time for packet of k-th queue is an inverse of service intensity and here is denoted as τ_k.

$$\tau_k=\frac{1}{\mu_k} \quad (3)$$

Offered load ρ_k with packets for k-th queue is defined as:

$$\rho_k=\frac{\lambda_k}{\mu_k} \quad (4)$$

Total offered load ρ is defined as:

$$\rho=\sum_{k=1}^{K}\rho_k \quad (5)$$

where K count of queues in the system. In this model K = 2. Necessary and sufficient condition, that the Markov's chain has a unique steady-state distribution is $\rho < 1$. *Waiting time* W_k is the interval from the arrival time of packet for k-th queue to the time when its transmission is started. In other words, W_k is the total time of packet in the queue. *Response time* T_k is defined as the time interval from the arrival time of an arbitrary packet for k-th queue to the time, when the packet leaves the system after the transition is finished. The response time consists of the waiting time and the service time.

2.2 Transition graph

A state of considered system is given by three indexes (k,i,j), where $k=\{1,2\}$, $i=\{1..L_1\}$ and $j=\{1..L_2\}$. k determines queue, that packet is actually transmitted, i determines number of packets of first queue (*priority packets*) and j the number of packet of second queue (*ordinary packets*) that are actually in the system. A value of state is determined by probability that system is in this state. In further text, only the steady-state probabilities are considered. If system can pass from one to another state, a transition exists between these states. Value of transition is determined by the mean intensity of arrival (λ_k) or departure (μ_k). All possible states of system and transition between them can be represented by transition graph (Figure 1).

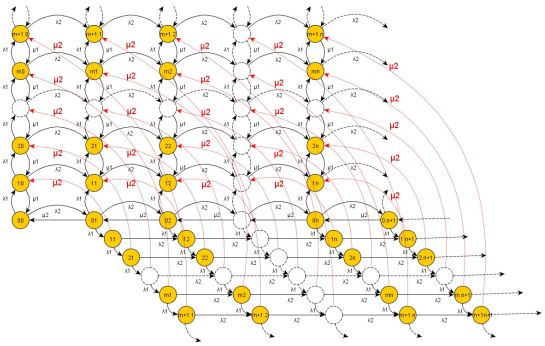

Figure 1 – Transition graph of PQ with two queues

2.3 Solution

Let

$$F_{1,i}(y)=\sum_{i=0}^{\infty}p_{1ij}y^i \;,\; F_{2,i}(y)=\sum_{i=1}^{\infty}p_{2ij}y^i \quad (6)$$

be the probability generating functions for states in i-th row on the vertical and horizontal layer of graph in the Figure 1.

Let

$$H_1(xy)=\sum_{i=1}^{\infty}F_{1i}x^i \;,\; H_2(xy)=\sum_{i=0}^{\infty}F_{2i}x^i \quad (7)$$

be probability generating functions for states on the vertical and horizontal layer of graph in the Figure 1.

Let $p_{0,0}$ be a probability of empty system. A probability generating probability function for the number of packets present in the system is given by

$$H(xy)=p_{00}+H_1(xy)+H_2(xy)=\sum_{k=1}^{2}\sum_{i=0}^{\infty}\sum_{j=0}^{\infty}p_{kij}x^i y^j \quad (8)$$

From *(7)*, *(8)* we have:

$$H_1(11)=\rho_1=\lambda_1/\mu_1,\; H_2(11)=\rho_2=\lambda_2/\mu_2,\; H(11)=1 \quad (9)$$

and next for their first derivate in $x=1, y=1$ we have:

$$\left[\frac{\partial H(xy)}{\partial x}\right]_{x=y=1} = \sum_{i=1}^{\infty} i x^{i-1}[F_{1,i}(y) + F_{2,i}(y)] = E[L_1] \qquad (10)$$

$$\left[\frac{\partial H(xy)}{\partial y}\right]_{x=y=1} = \sum_{i=1}^{\infty}\sum_{j=1}^{\infty} j y^{j-1}[p_{1,i,j} + p_{2,i,j}] = E[L_2] \qquad (11)$$

It is well-known fact that for Markov's systems with infinite queues and shared service holds:

$$p_0 = 1 - \sum_{k=1}^{K} \rho_k \qquad (12)$$

where p_0 is probability, that a system is empty.
Thus for p_{00} we have in this model:

$$p_{1,0,0} = p_{2,0,0} = p_{0,0} = 1 - \rho_1 - \rho_2 \qquad (13)$$

Following system of equations describes probabilities of particular states:

$$(\lambda_1 + \lambda_2)p_{0,0} = \mu_1 p_{1,1,0} + \mu_2 p_{2,0,1} \qquad (14)$$

$$(\mu_1 + \lambda_1 + \lambda_2)p_{1,i,0} = \lambda_1 p_{1,i-1,0} + p_{2,i,1} + \mu_1 p_{1,i+1,0} \quad i = 1...\infty \qquad (15)$$

$$(\mu_2 + \lambda_1 + \lambda_2)p_{2,i,1} = \lambda_1 p_{2,i-1,1} \quad i = 1...\infty \qquad (16)$$

$$(\mu_2 + \lambda_1 + \lambda_2)p_{2,0,j} = \lambda_2 p_{2,0,j-1} + \mu_1 p_{1,1,j} + \mu_2 p_{2,0,j+1} \quad j = 1...\infty \qquad (17)$$

$$(\mu_1 + \lambda_1 + \lambda_2)p_{1,1,j} = \lambda_2 p_{1,1,j-1} + \mu_1 p_{1,2,j} + \mu_2 p_{2,1,j+1} \quad j = 1...\infty \qquad (18)$$

$$(\mu_1 + \lambda_1 + \lambda_2)p_{1,i,j} = \lambda_2 p_{1,i,j-1} + \mu_1 p_{1,i+1,j} + \\ + \mu_2 p_{2,i,j+1} + \lambda_1 p_{1,i-1,j} \quad i = 2...\infty, j = 1...\infty \qquad (19)$$

$$(\mu_2 + \lambda_1 + \lambda_2)p_{2,i,j} = \lambda_2 p_{2,i,j-1} + \lambda_1 p_{2,i-1,j} \quad i = 1...\infty, j = 2...\infty. \qquad (20)$$

By multiplying these equations with x^i, y^j and summing for all i, j we obtain:

$$(\lambda_1 + \lambda_2)p_{0,0} = \mu_1 p_{1,1,0} + \mu_2 p_{2,0,1} \qquad (21)$$

$$(\mu_1 + \lambda_1 + \lambda_2)\sum_{i=1}^{\infty} p_{1,i,0}x^i = \lambda_1 x\sum_{i=0}^{\infty} p_{1,i,0}x^i + \frac{\mu_2}{y}\sum_{i=1}^{\infty} p_{2,i,1}x^i y + \frac{\mu_1}{x}\sum_{i=2}^{\infty} p_{1,i,0}x^i \qquad (22)$$

$$(\mu_2 + \lambda_1 + \lambda_2)\sum_{i=1}^{\infty} p_{2,i,1}x^i y = \lambda_1 x\sum_{i=0}^{\infty} p_{2,i,1}x^i y \qquad (23)$$

$$(\mu_2 + \lambda_1 + \lambda_2)\sum_{j=1}^{\infty} p_{2,0,j}y^j = \lambda_2 y[\sum_{j=1}^{\infty} p_{2,0,j}y^j + p_{0,0}] + \\ + \frac{\mu_1}{x}[\sum_{j=0}^{\infty} p_{1,1,j}xy^j - p_{1,1,0}x] + \frac{\mu_2}{y}[\sum_{j=1}^{\infty} p_{2,0,j}y^j - p_{2,0,1}y] \qquad (24)$$

$$(\mu_2 + \lambda_1 + \lambda_2)\sum_{j=0}^{\infty} p_{1,1,j}xy^j - p_{1,1,0}x = \lambda_2 y\sum_{j=0}^{\infty} p_{1,1,j}xy^j + \\ + \frac{\mu_1}{x}[\sum_{j=0}^{\infty} p_{1,2,j}x^2y^j - p_{1,2,0}x^2] + \frac{\mu_2}{y}[\sum_{j=1}^{\infty} p_{2,1,j}xy^j - p_{2,1,1}xy] \qquad (25)$$

$$(\mu_1 + \lambda_1 + \lambda_2)[H_1(xy) - \sum_{j=1}^{\infty} p_{1,1,j}xy^j - \sum_{i=1}^{\infty} p_{1,i,0}x^i] = \\ = \lambda_2 y[H_1(xy) - \sum_{j=0}^{\infty} p_{1,1,j}xy^j] + \frac{\mu_1}{x}[H_1(xy) - \sum_{j=1}^{\infty} p_{1,2,j}x^2y^j - \\ - \sum_{j=1}^{\infty} p_{1,1,j}xy^j - \sum_{i=1}^{\infty} p_{1,i,0}x^i] + \frac{\mu_2}{y}[H_2(xy) - \sum_{j=2}^{\infty} p_{2,1,j}xy^j - \\ - \sum_{j=1}^{\infty} p_{2,0,j}y^j - \sum_{i=1}^{\infty} p_{2,i,1}x^i y] + \lambda_1 x[H_1(xy) - \sum_{i=1}^{\infty} p_{1,i,0}x^i] \qquad (26)$$

$$(\mu_2 + \lambda_1 + \lambda_2)[H_2(xy) - \sum_{j=1}^{\infty} p_{2,0,j}y^j - \sum_{i=1}^{\infty} p_{2,i,1}x^i y] = \\ = \lambda_2 y[H_2(xy) - \sum_{j=1}^{\infty} p_{2,0,j}y^j] + \lambda_1 x[H_2(xy) - \sum_{i=0}^{\infty} p_{2,i,1}x^i y] \qquad (27)$$

After summing *(22), (25), (26)* we get:

$$(\mu_1 + \lambda_1 + \lambda_2 - \lambda_2 y - \lambda_1 x - \frac{\mu_1}{x})H_1(xy) = \\ = \frac{\mu_2}{y}H_2(xy) + \lambda_1 x p_{00} - [\mu_1 F_{1,1}(y) + \frac{\mu_2}{y}F_{2,0}(y)] \qquad (28)$$

and after summing *(21), (23), (24), (27)* we get:

$$(\mu_2 + \lambda_1 + \lambda_2 - \lambda_2 y - \lambda_1 x)H_2(xy) = \\ = (\lambda_2 y - \lambda_1 - \lambda_2)p_{0,0} + \mu_1 F_{1,1}(y) + \frac{\mu_2}{y}F_{2,0}(y). \qquad (29)$$

From *(6)*, *(21)* and *(24)* we get relation between $F_{1,1}$ and $F_{2,0}$:

$$\mu_1 F_{1,1}(y) = (\mu_2 + \lambda_1 + \lambda_2 - \lambda_2 y - \frac{\mu_2}{y})F_{2,0}(y) + \\ + (\lambda_1 + \lambda_2 - \lambda_2 y)p_{0,0} \qquad (30)$$

From *(28), (29), (30)* we are able to determine $H_1(xy)$ and $H_2(xy)$. Thus now we write according to *(8)*:

$$H(xy) = \frac{\mu_1 p_{00}(1-x)y(\lambda_2 y - \lambda_2 - \mu_2 - \lambda_1(1-x))}{(\lambda_1 - \lambda_1 x - x(\lambda_1(1-x) + \lambda_2(1-y)))y(\lambda_2 y - \lambda_2 - \mu_2 - \lambda_1(x-1))} + \\ + \frac{F_{2,0}(y)(\lambda_1 + \lambda_2 + \mu_2 - \lambda_2 y)(\lambda_2 x(1-y) - \mu_1 y(1-x))}{(\lambda_1 - \lambda_1 x - x(\lambda_1(1-x) + \lambda_2(1-y)))y(\lambda_2 y - \lambda_2 - \mu_2 - \lambda_1(x-1))} \qquad (31)$$

Hence we have depending for $H(xy)$ only on unknown $F_{2,0}(y)$. For $x \to 1, y \to 1$ from *(9),(29)* and *(30)* we have:

$$F_{2,0}(1) = \frac{\lambda_2}{\lambda_1 + \mu_2} \qquad (32)$$

After partial derivation of *(31)* by x and applying limits $x \to 1$, $y \to 1$ and substituting *(32)* into *(31)*, we obtain the mean number of priority packets in the system finally:

$$E[N_1] = \frac{\lambda_1(\lambda_2\mu_1 + \mu_2^2)}{(\mu_1 - \lambda_1)\mu_2^2} \qquad (33)$$

Now we apply *Little's formula* to *(33)* to obtain the mean response time of priority packets:

$$E[T_1] = \frac{E[N_1]}{\lambda_1} = \frac{\lambda_2\mu_1 + \mu_2^2}{(\mu_1 - \lambda_1)\mu_2^2} \qquad (34)$$

3 Conclusion

This paper show, how can be used Markov's chains to modelling QoS mechanism Priority Queuing. The final result of the paper is formula for the response time of priority packet. For the sake of simplicity are assumed only two queues. Moreover, the queues are infinite. If we considered model with finite queues, the number of equations analogous to (14)-(20) would be increased to 16 and the model solution would be too complicated.

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Primary Paper Section: I

Secondary Paper Section: N

FEATURE SELECTION FOR APPLICATION RECOGNITION IN COMMUNICATION NETWORKS

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Research described in this paper was done within the grant No. 1/0214/10 of the Slovak Grant Agency VEGA.

Abstract: Feature selection is important part of any machine learning process. In our work, we describe methods for feature selection, in order to perform classification of network traffic based on statistical features of the flow. For this purpose, we implemented Sequential forward selection method for feature subset selection. The features used for this method of traffic classification include packet sizes, port numbers, protocol, use of TCP flags and more. We try to identify the most important features and we evaluate generated feature subsets by Naïve Bayes classifier.

Keywords: feature selection, machine learning, traffic classification, traffic representation

1 INTRODUCTION

The research of traffic classification in communication networks is looking for techniques that do not rely on port numbers or packet payload examination. Recent work is emerging on the use of statistical traffic characteristics to assist in classification process. The application of machine learning techniques is very promising in this field [1]. When performing the classification using methods of machine learning, finding a good set of features is essential for the accuracy of classifier. In this paper we present methods for traffic classification and particularly feature selection to identify the most important of available features.

1.1 Classification using port numbers

First application classification practices used to rely on the use of transport-layer port numbers. In the case flow is classified assuming, that the most applications use "well known" TCP or UDP port numbers [1]. These port numbers are visible in TCP or UDP packet headers. In this approach, classifier only compares these obtained port numbers with IANA list [2] that is freely available. In Table 1 we can see port numbers for some popular applications. This approach could have been effective in the early days of internet, but currently it provides very limited information. The reason is, that many applications (intentionally or not) use inconsistent or random ports. Applications also might not be registered in IANA. This approach is also impossible to use for proprietary protocols. It was also reported that only 50 – 70 % of traffic was classifiable using IANA list [3]. Also, the proportion of encapsulated or encrypted traffic is increasing, what makes this approach less usable in the future.

Port number	Application
20	FTP - data
21	FTP - control
22	SSH
23	Telnet
25	SMTP (Simple Mail Transfer Protocol)
53	DNS
80	HTTP
110	POP3
194	IRC
443	HTTPS

Table 1: Port numbers for several popular applications

1.2 Payload based classification

Current methods for reliable traffic classification require examination of packet payload. Classifier simply looks for a application - specific string in a packet payload and compares it with a list of applications with their "signatures" [1]. In Table 2 we can see some application specific strings from packet payload. However, this is a very difficult task to perform. The first problem are privacy and legal issues, because this approach requires capture of whole packet payload and its examination. Another difficulty is the complexity of this operation. If we wanted to capture each packet on a high speed link, our computer would probably soon run out of space and memory. We also have to deal with problem that this signature can be on different place in packet for each application so we need to go through a large amount of data [4]. Though, main problem of the approach is its infeasibility if the packet payload is encrypted.

Application	String
eDonkey2000	0xe319010000
MSN messenger	"PNG"0x0d0a
IRC	"USERHOST"
NNTP	"ARTICLE"
SSH	"SSH"
BitTorrent	0x13BitTorrent
PPLive	0xE903

Table 2: Characteristic strings for several applications

1.3 Host behavior based classification

Host behavior-based approach was developed to capture social interaction observable between host computers. The BLINC [5] captures the profile of a host, based on other hosts it communicates with, applications the host is engaged in by comparing the captured profile (built in) with host behavior signatures of application servers, and then classifies traffic flows. This is done on 3 levels. At social level, behavior of a host indicated by its interactions with other hosts and popularity is captured. At functional level behavior at terms of its functional role in the network (provider, consumer, collaborative application) is captured. At application level, transport layer interactions between hosts are captured, with intent to identify the application of origin. Though, complete and reliable application using BLINC approach have not been developed yet.

1.4 Classification based on flow statistical properties

Because of limitations of previous methods, we treat the problem of classification as a statistical problem. In this approach, we assume that traffic at the network layer has statistical properties which contain enough variance to distinguish among certain classes of applications. This enables us to detect applications in which we are interested. We try to find some different properties of flows that are based on observations and distributions of many various flows. These might include statistics either of individual packets or whole flows. Our goal is to choose statistics that provide us relevant information about flow and are (ideally) different for each application. For each flow packet size distribution and packet inter – arrival times exhibit high amount of variation [6] so they are among statistics commonly used for traffic classification [7, 8, 9]. There are other statistics which are used for traffic classification and these include flow size and duration [9, 10], TCP-specific values (e.g. total payload bytes transmitted, total number of PUSHED packets, total number of ACK packets carrying SACK information etc.) [7], effective bandwidth or entropy based [7, 11]. There are of course many other statistics that can help us to recognize the applications. The extensive list of flow features can be found for example at [12].

2 DATA USED IN ANALYSIS

While some problems solved with machine learning have "standard" dataset (e.g. FERET for faces) on which we can test and train machine learning algorithm, in traffic classification there is no such dataset. In practice, we have to either capture our own traffic, or deal with a limited quantity (and quality) of datasets. There is also problem, that these datasets are mostly not pre – labeled, so for training with supervised learning algorithms we need to put aside a part of dataset and classify it either manually of with a help of some software. However, this approach does not guarantee that our training data is well labeled. Own traffic can be obtained using any packet capturing software. We have to keep in mind that properties of traffic vary at different places in network, or at different time. In this paper we work with part of UNIBS dataset [13]. It is anonymized, payload stripped dataset collected at University of Brescia, which is relatively recent, because it was collected in October/November 2009. The workstations operated the Ground Truth (GT) system which is used for associating accurate ground truth information with internet traffic traces. By probing the monitored host's kernel to obtain information on open internet sessions, GT gathers guaranteed truth at the application level. UNIBS dataset also provides outcome of the DPI (Deep Packet Inspection) packet payload analysis considering first 200B of data for each packet and signature patterns. Based on this information we are able to infer the application of origin or at least class of application, that generated each network flow. We selected 6 classes of applications (SSH, TELNET, HTTP, POP3, FTP, HTTPS).

3 FEATURES OF NETWORK FLOWS

3.1 Feature extraction

When using statistical methods for network flow classification, we need to obtain features for each flow, which enable us to recognize the application of interest. Authors in paper [12] provide 249 features (also called discriminators) that can be obtained from each flow. Many of these features can be redundant, but many of currently used features is subset of features used here. The features selected for traffic classification usually include: packet sizes, packet inter-arrival times, number of transmitted packets (or bytes), count (or ratio) of packets with TCP flag set, port numbers and protocol. Most of these features should be intact even after encryption, so it might be possible to classify also encrypted traffic. List of features used in our tests is in Table 3.

Feature number	Description
1	Packet sizes
2	Source port
3	Destination port
4	Sent / received packets ratio
5	Duration of the flow
6	SYN flag packet ratio
7	RST flag packet ratio
8	FIN flag packet ratio
9	Sent packet size variance
10	Received packet size variance
11	Protocol
12	#packets in the flow

Table 3: List of tested features

3.2 Feature selection

Feature selection is important part of data processing, because it removes redundant or irrelevant features from our dataset. If we can select the most important features of network traffic we not only increase the precision of classifier, but also significantly reduce its complexity. Identification of the smallest possible set of features is a key part of classifier's design [14].
Quality of feature set is essential for performance of ML algorithm. Including too many unneeded features has negative impact on precision of most ML algorithms. Also, the number of data that needs to be processed grows with dimensionality of features.
Generally, feature selection consists of several steps as we can see in Figure 1. The first step is generation of candidate subsets. Each subset is evaluated and when the stopping criterion is met, the validity of selected subset is tested. We can divide feature selection methods to 2 classes [14]: filter a wrapper methods, which we are going to discuss later in this paper. These methods usually require algorithm for searching the subspace of features. Number of subset search algorithms can be used, which include [1]: Greedy search, Best first search, Sequential forward selection or use of genetic algorithms.

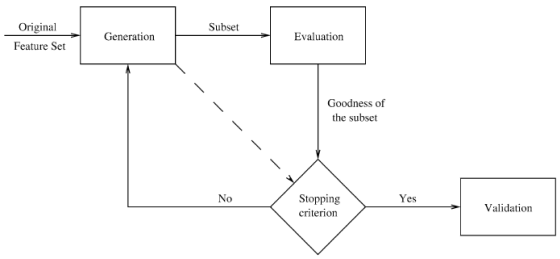

Figure 1 [15]: General scheme of feature selection

3.3 Filter methods for feature selection

Many filter methods for feature selection can be used e.g. Correlation based feature selection (CFS) and Consistency based feature selection. CFS algorithm examines the importance of features by measuring the mutual correlation. The method is based on the hypothesis that good feature subsets contain features highly correlated with the class, yet uncorrelated with each other.
The consistency based approach looks for inconsistent features in the dataset. The pattern is considered inconsistent if there exist at least two instances such that they match all but their class labels. The inconsistency rate of a feature subset is calculated as a ratio of inconsistent patterns from all patterns in the set. Based on this rate, the new feature subsets are selected [14].

3.4 Wrapper methods for feature selection

Wrapper methods select the best feature subset by ML algorithm that will be used for classification. Subset with the highest overall precision is considered to be the best. Because this method needs to execute the ML algorithm for each subset, they might be impractical and complex for big feature sets or slow ML algorithms. The accuracy of classification is of course the highest, if the algorithm for feature selection and classification is the same [15]. Subsets of features generated by wrapper methods, are the upper limit for classification accuracy, but they are not comparable to results obtained by filter methods (because the features are different).

3.5 Common features for traffic classification

Feature selection is usually treated with great attention. In some papers authors focus on classification using just packet sizes. They are usually divided to several intervals (bins). Of course, for classification can be used wide variety of features. For example, authors in [16] select their features from 37 and use

CFS to select the most important features using best first search method. They state the packet size, protocol, port numbers and TCP flag information are the most important features for their method of classification. Use of this selected subset degrades the accuracy of classifier by 0.1 – 1.4 % while the training is 10 times faster. Packet inter – arrival times were not selected to any subset, probably because on their strong dependence of used link.

4 RESULTS

We implement wrapper feature selection method for traffic classification. The traffic is classified into 6 classes : SSH, TELNET, HTTP, POP3, FTP, HTTPS. From each class 200 flows were selected. The Machine learning algorithm for evaluation of feature subsets is Naïve Bayes. We consider the set of features from Table 3. The packet sizes were divided into 4 intervals. We take direction of the packets into account (from client / from server), so each flow is by 8 bins.

For selecting the features to each subset we chose the algorithm of sequential forward selection [17]. The feature which has the maximal classification accuracy is selected as the first component of the resulting feature vector. Then we calculate accuracy for all pairs of features having the first feature fixed. The pair manifesting minimum total classification error is chosen as a starting point for the next step. In similar way, we proceed further for triples, n-tuples, etc., unless all the features are processed. The results in Table 4 show combinations of features with their accuracy. For convenience, we only use the sequence number to represent the features in Table 3. The highest accuracy is printed in bold.

Selected feature	Accuracy
1	68,80%
1, 2	85,50%
1, 2, 4	87,20%
1, 2, 4, 11	86,70%
1, 2, 4, 11, 3	88,10%
1, 2, 4, 11, 3, 6	**88,70%**
1, 2, 4, 11, 3, 6, 8	87,50%
1, 2, 4, 11, 3, 6, 8, 10	87,40%
1, 2, 4, 11, 3, 6, 8, 10, 12	88,00%
1, 2, 4, 11, 3, 6, 8, 10, 12, 9	87,80%
1, 2, 4, 11, 3, 6, 8, 10, 12, 9, 5	87,40%
1, 2, 4, 11, 3, 6, 8, 10, 12, 9, 5, 7	87,60%

Table 4: Features selected by sequential forward selection

5 CONCLUSION

Since there is a great amount of features we can obtain from statistical properties of the flow, feature selection plays a vital role in classification process. In this paper we proposed a wrapper – based method for feature selection using sequential forward selection. The results show that among the most important features in our dataset are packet sizes, source / destination ports, ratio of sent and received packets, protocol and ratio of packets with SYN flag set. Using these features we can obtain classification accuracy 88,7% using simple Naïve Bayes classifier. With a limited set of 3 features, classifier is still able to achieve accuracy just 1,5% lower.
This paper presents only our preliminary results. In future we plan to implement more feature selection methods to identify the most important features of the flow. Also use of other Machine learning algorithms might increase the classification accuracy.

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Primary Paper Section: I

Secondary Paper Section: D, G, L

J INDUSTRY

IN	INFORMATICS
JA	ELECTRONICS AND OPTOELECTRONICS
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THE INFLUENCE OF COOLING BLOW MOULDING PROCESS ON MECHANICAL BEHAVIOR

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This article was written with support of research project TUL/ FS/ 282

Abstract: Plastic materials are in general bad heat conductor therefore is apply for their production the temperature/ cooling systems. The system is able expressively reduce time of working cycle which increase profit of company. It is important to know that this effect brings influence behavior of plastic. The article descriptions in next pages are examined influence of cooling effect on mechanical behavior of plastic products which was production in blow moulding technology. Mechanical behavior is evaluated with help of tensile strength and deformation characteristics.

Keywords: Blow Moulding Process, Cooling System, Mechanical Behavior

1 Introduction

The aim of all producer company is produce products with maximum profitability. The ways how to get this stage is a lot. One very often application possibility is reduction time of production. Plastic material have in general bad heat conductor and so take the longest time of production cycle time of cooling. Therefore is very important looking for the optimally way of cooling. There are a lot of studies which are aim on these issues.

This article deals with cooling of blow moulding process. The cooling process is possible separate into two different temperature cooling systems. The first one is temperature cooling system of mould and second part is cooling inside blowing product (from blowing medium-usually Air). When we comparing efficiency of both systems we can unambiguously say that the cooling efficiency of mould is expressively bigger. It is because the common blowing medium - Air has low heat transfer coefficient in standard condition /2/. The right proposal of temperature cooling system of mould is therefore necessary condition for minim production time. It is important to know that the reduce time of production have influence on change of structure behavior of polymer materials. Change structure behavior impresses of change next behavior for example mechanical, physical, optical behavior etc. This article examine just by the influence cooling effect on mechanical behavior. Mechanical behavior is evaluated in relation to their tensile strength and deformation characteristic.

2 Blowing Process

This capitol presented the reader parts which entered to blowing process. It is used blowing machine, material of product, product, set up parameters. Next it is here showed and clears up using cooling system of blowing mould.

2.1 Blowing Machine

In this experiment it was used blowing machine GM 251 from company GDK s.r.o Karlovy Vary. The cooling effect blowing process on mechanical behaviour was examined on product void content 200 ml. It is bottle which has easy and periodical shape (figure 1). Bottle was blowing from material PE – HD Liten BB 29.

2.2 Set up Parameters

For finding influence of cooling effect on research behaviour it was made three solved set up parameter of blowing process which are demonstrated on table number 1. How it was said from look the producer company is the main attributed in this process time of cooling. From look of technology is the main parameter speed of screw. Because the rate speed of screw influence the whole time dependent of process (faster speed of screw brings shorter time of process, more slowly speed brings longer time of process-cooling). This parameter is limited with shape stability of product by which is drawing (it is dependents on cooling efficiency) and with working possibility of machine. The too much fast running speed of screw leads to heating of transmission box and excessively abrasion parts of machine. The maximum recommended running speed of screw is for this machine 120 round/min but our product had not by this parameter enough shape stability. The maximum speed whereat it was made good products was by parameter 100 round/min and the ideal cooling effect it was by value 40 round/min. For discover influence of cooling system on mechanical behaviour it was made the third measured without connected cooling system.

Tab.1 Process parameters of blowing machine

Parameters	1.Maximum	2.Optimal	3.Without cooling
Speed of screw	100 [round/min]	40 [round/min]	40 [round/min]
Time of cycle	17 [s]	39 [s]	39 [s]
Time of cooling	14 [s]	36 [s]	36 [s]
Time of blowing	14 [s]	36 [s]	36 [s]
Machine time	3 [s]	3 [s]	3 [s]
Temperature of parison	195 [°C]	195 [°C]	195 [°C]
Blowing pressure	0,3 [MPa]	0,3 [MPa]	0,3 [MPa]

2.3 Blowing Mould

The temperature cooling system of mould for blow moulding process working on the same principle as temperature system for the injection moulding process. It is system of drilled channel connect together when circulated liquid medium (most often water) keeps temperature field on set up degree (figure 1). The channel system lead away transmits heat from melt of plastic and so shortening time of cooling. The temperature cooling system is complicated process where enter to mutual interaction a lot of factors: place and shape of channel, type and rate circulated medium, material of mould and fixative desk, etc. In produce factory is the temperature of cooling medium for blowing process usually using in range 5-20 °C. Of course that the lower value brings more efficiency of cooling system but we have to be careful with using this parameter because low value can made condensations water on parts of mould and next surface defects of products. For this experiment it was used temperature of cooling medium 15 °C.

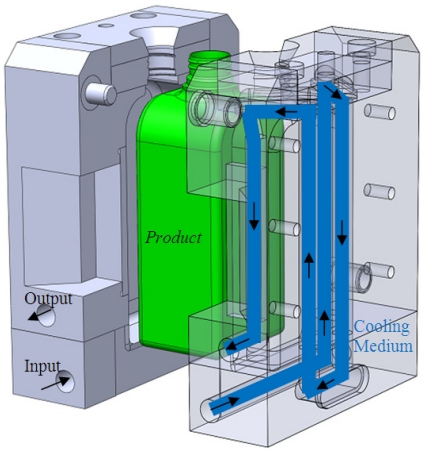

Fig. 1 Blowing mould with cooling system of drilled channel

3 Experiment

In this chapter are presented the results of measured experiments. The mechanical behavior is here confronted in relation to their tensile strength and deformation behavior. Tensile strength is analyzed with help of yield strength which is

for this type material the same as ultimate strength. The deformation behavior is able evaluated with help of modulus of elasticity in tension and relative deformation. From detection evenness of cooling efficiency it was took the tests specimens in different place which are showed on the picture 2. The test specimens have a normalized shape (ČSN EN ISO 527-2) type 1BA. The specimens were loaded uni-axial tensile stress at a constant speed 10 mm/min on blasting machine Housnfield H 10 KT.

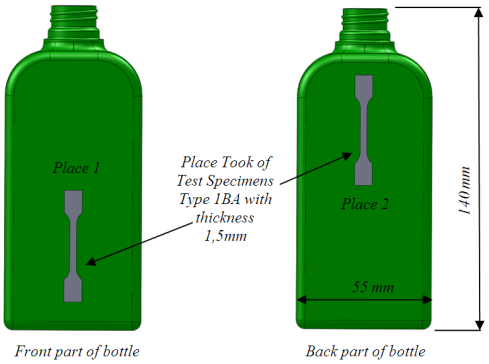

Fig. 2 The place took of test specimens

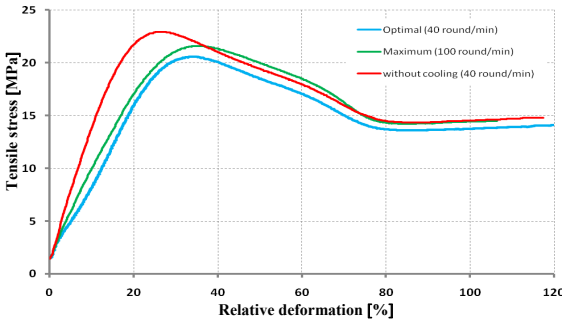

Fig. 3 The tensile diagram of test specimens took of place 1

Tab.2 The test specimens took of place 1

Examining Process	σ_v [MPa]	ε_y [%]	σ_B [MPa]	ε_B [%]	E [MPa]
Without cooling (40 round/min)	23,89 ± 1,02	25,77 ± 1,52	15,03 ± 2,21	410 ± 55	420 ± 32
Optimal (40 round/min)	22,05 ± 1,59	34,96 ± 1,33	14,98 ± 1,04	469 ± 31	345 ± 43
Maximum (100round/min)	21,12 ± 2,01	32,85 ± 0,98	13,75 ± 1,43	502 ± 29	363 ± 60

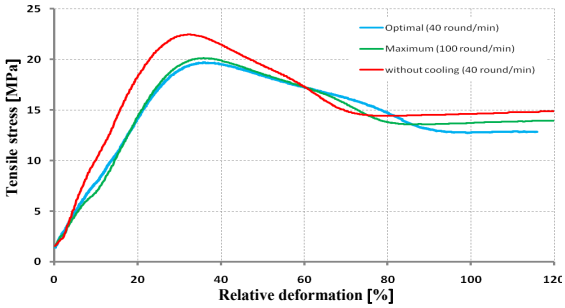

Fig. 4 The tensile diagram of test specimens took of place 2

Tab.3 The test specimens took of place 2

Examining Process	σ_y [MPa]	ε_y [%]	σ_B [MPa]	ε_B [%]	E [MPa]
Without cooling (40 round/min)	22,54 ± 1,26	32,04 ± 1,17	15,10 ± 1,34	427 ± 52	400 ± 43
Optimal (40 round/min)	20,09 ± 2,10	35,97 ± 1,21	13,75 ± 2,03	376 ± 71	380 ± 35
Maximum (100 round/min)	19,87 ± 1,18	36,08 ± 1,42	14,81 ± 2,60	483 ± 38	371 ± 31

4 Conclusion

How it was said the aim of all producers is to reduce production time of products. The plastic material have in general bad heat conductor and therefore is to production apply cooling system which can expressively reduce time of working. We have to let know that the reduction time have influence in dependence on change structure behavior on other behavior of plastic. It is for example mechanical, physical, optical behavior etc. This article examines cooling effect of blowing process on mechanical behavior of small blowing product. For detection of cooling effect it was applied three different set up parameters of blowing process. The first one it was by running speed of the screw 100 round/min. which ensured the minimum necessary cooling time. The second set up it was by running speed of screw 40 round/min which ensured the best cooling effect (even distribution of temperature) because the cooling system of mould working longer time. The last set up it was created running speed of screw 40 round/min by not connection cooling system.

The mechanical behavior are predetermined their structural behavior. The theoretically and experiment research say that semicrystal polymers reach bigger rate of crystallinity by highest temperature of cooling then by lower temperature. It is because grow of crystallic structure (spherolits) is not suppress fast cooling and spherolits have longer time to grow /1/. For our experiment it means that with lower efficiency of cooling should increase area of spherolits and so rate of crysltallinity. The experiment set up parameters of blowing moulding machine without connect cooling medium reach the lowest cooling efficiency than should get the highest rate of crystallinity. On the other side the set up parameters with optimal cooling should get the lowest rate of crystallinity. For easy opinion on change structure it was made the analysis of density - immersion method (ČSN EN ISO 1183 -1). We can say that with increasing destiny of polymers increase rate of crystallinity because crystallic phase have more density than amorphous phase. From the results which are interprets in table 4 it is possible confirm this theory but with reminder that the difference are very low.

The influence of semicrystal structure on mechanical behavior is that the material which have higher area of spherolits and rate of crystallinity reach higher tensile strength behavior but degrease of deformation behavior because the big spherolits evoked brittleness of materials. With regard to above mentioned results it possible says that examined test specimens from production process without connection cooling system should reach the most value of tensile strength (ultimate strength) with highest tensile modulus and the lower deformation behavior (relative deformation). The opposite dependence should get by test specimens with optimal cooling time. The results of measured experiment confirm this opinion but with relation to this value it necessary says that the difference with regard to their deviation is very low. For production company it mean that the cooling effect had not significant influence on mechanical behavior but it is question how cooling effect of blowing process had influence on another behavior of polymers.

Tab.4 The immersion exam of density

Parameters	Without cooling	Optimal	Maximum
Took of Place 1	943 [kg/m^3]	937 [kg/m^3]	940 [kg/m^3]
Took of Place 2	939 [kg/m^3]	936 [kg/m^3]	935 [kg/m^3]

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Primary Paper Section: J

Secondary Paper Section: JP

ACTUAL PROBLEMS OF THE WIND ACTIONS ON STRUCTURES AND APPLICATION OF EUROCODES

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This paper was supported by VEGA, registration number 1/1119/11.

Abstract: In accordance with implementing EN 1991-1-4 to Slovak National Standards it is necessary to take into account aero-elastic instabilities and resonant response due to wind actions. The pressures or forces whose effects are equivalent to the extreme effects of the turbulent wind represent the wind action. The effect of the wind on the structures as well as the response of the slender structures depend on the size, shape and dynamic properties of the structures, orography and meteorological data, type of terrain and reference height. Dynamic response should be considered for flexible structures like masts, chimneys, towers, open frames or canopy roofs, and structural elements of open lattice structures, cables.

Keywords: Wind velocity, resonance, aerodynamic coefficient, wind amplitudes, wind pressure, aero-elastic instabilities, turbulence

1 Introduction

The recent years were accompanied by the rise of the wind storms and height of wind velocity. Therefore it becomes necessary to consider also dynamic wind effect and possible resonance response for the structures, which are sensitive to the wind action and the wind is dominant design factor, as for example light halls, canopy roofs, free standing walls, signboards, cables, light masts, chimneys, towers, open frames and structural elements of open lattice structures, footbridges.
The basic parameter for determination of the wind load of the structure is peak velocity pressure q_p, which contains mean wind velocity and fluctuating part of wind velocity- turbulence. This is influenced by the atmospheric conditions in the given locality, height above terrain and local influences, as for example roughness and orography, season and wind direction. The peak velocity pressure is calculated as the pressure in conditions of the mean wind speed and short-term velocity fluctuations. The intensity of turbulence near the ground according to the Euro codes reaches up to 42%. The overall response of the structure is regarded as the superposition of two components – quasi-static and resonant. For the most of structures the resonant components are negligible and they can be counted by the dynamic coefficient.
The special attention must be paid to the phenomena of aero elastic instability as stochastic and resonance response, vortex shedding, divergence, galloping and flutter, which may be observed on the slender light and flexible structures.
EN 1991-1- 4 with national annex STN EN 1991-1-4/NA give guidance on the determination of natural wind action, which take into account specific Nationally Determined Parameters to be used for the design in Slovakia. Wind action on the structure is dependent on the location and quality of meteorological data, terrain category, etc.

2 Wind action on light structures situated near the ground

Due to big influence of turbulence near the ground, light steel and wooden structures are exposed to bigger gust of wind.
Recommended rule for determination of peak velocity pressure (1) according to EN 1991-1-4 is:

$$q_p(z) = \left[1 + 7I_v(z)\right] \cdot 1/2 \cdot \rho \cdot v_m^2(z) = c_e(z) \cdot q_b \qquad (1)$$

The values of peak velocity pressure are much higher than according to STN 73 0035.
The intensity of turbulence is defined:

$$I_v(z) = \frac{\sigma_v}{v_m(z)} = \frac{k_I}{c_o(z) \cdot ln(z/z_0)} \qquad (2)$$

The turbulent intensity at height z is the standard deviation of turbulence divided by mean wind velocity. Value near the ground for different terrain is between 22 – 42 % (see Fig.1)

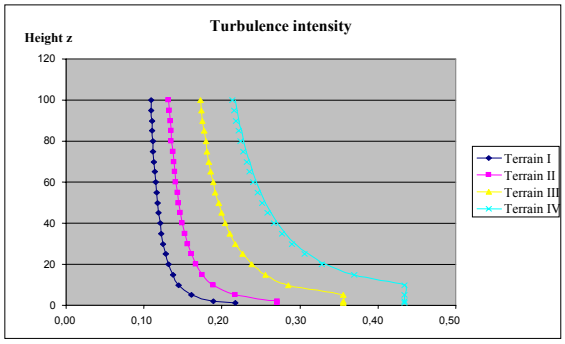


Fig. 1 The turbulence intensity as a function of height and terrain category

Comparison of internal forces due to wind action on the light steel hall (see Fig.2), which is situated in terrain category III (subtopia) was calculated according to EN 1991-1-4 and also according to STN 73 0035 is illustrated in diagram in the Fig.3.

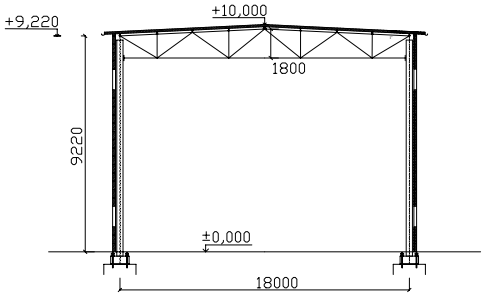
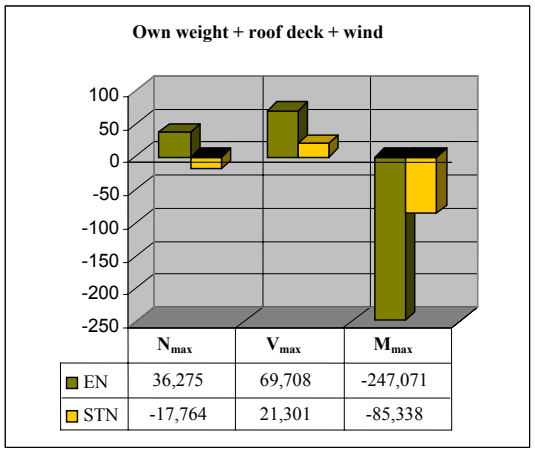


Fig.2 Light steel hall

From the diagram in the Fig. 3 we can see, that the Euro code is much stronger for wind action on the structures than STN.



	N_{max}	V_{max}	M_{max}
EN	36,275	69,708	-247,071
STN	-17,764	21,301	-85,338

Fig.3 Comparison of wind load due to EN 1991-1-4 and STN 73 0035

It is caused especially by higher value of wind pressure, which take into account intensity of turbulence also for quasi-static calculation (peak velocity pressure at height 10m, calculated by EN 1991-1- 4 gives value $q_p(z = 10m) = 0{,}993 kN.m^{-2}$, this value compares to the same part of wind load $w_k.\kappa_w = 0{,}363\ kN.m^{-2}$ due to STN 73 0035 is 274% greater). Also the wind action on the roof of the hall is different for the different codes. Euro-code EN 1991-1-4 divides roof into five zones with different pressure coefficients, compared to code STN 73 0035, which divides area of the roof only in two zones. The biggest differences are manifested in bending moments (Fig.3).

2.1 Free-standing walls

Results of experimental measurements in the wind tunnel give us for free standing walls, parapets, fences different resulting pressure coefficients. Coefficients are specified for zones A, B,C and D (see Fig.4). The highest values of the wind pressure were observed near the corner, for the wind direction 45 °.

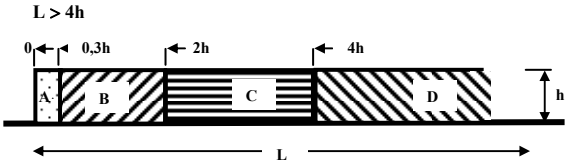


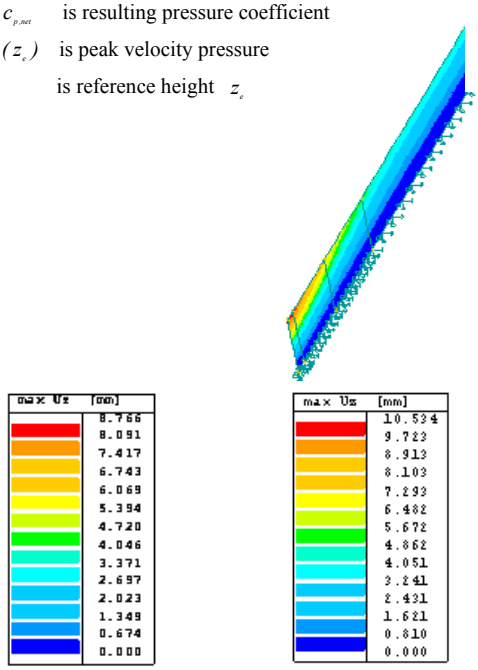
Fig. 4 Zones of free standing walls with different resulting pressure coefficients

$$w_{net} = c_{p,net} \cdot q_p(z_e) \quad (3)$$

where $c_{p,net}$ is resulting pressure coefficient

$q_p(z_e)$ is peak velocity pressure

is reference height z_e



a/ Terrain category IV (city centers)

b/ Terrain category II (area with low vegetation and isolated buildings)

Fig. 5 Influence of wind effect in the zone A for free standing concrete wall

The values of resulting wind coefficients $c_{p,net}$ depend on the solidity ratio φ, and geometry of structures (L/h) and from the corners of the walls. The highest value of the wind pressure according to EN 1994-1-4 is in the zone A (see Fig. 4). Influence of the zone A for different terrain category can be seen in the Fig.5, where are presented the values of the horizontal deflection due to turbulent wind actions. Numerical application was calculated for full concrete wall: φ=1, h = 5 m and L = 50m (Fig. 5). Fundamental wind velocity was v_b = 26 m/s. For the free-standing walls and parapets with solidity ratio φ = 0,8 are the pressure coefficients smaller and the same /equal/identical for all zones A,B,C,D.

3 Wind actions on the free standing canopy roofs

The response of structures due to wind actions can be observed on the canopy roofs – structures that do not have permanent walls, such as stadiums, petrol stations, dutch barns, etc. The wind distribution over frequencies is according to experimental measurements for the sport stadium (see 6. and Fig.6) expressed by the non-dimensional power spectral density function (Fig.7).

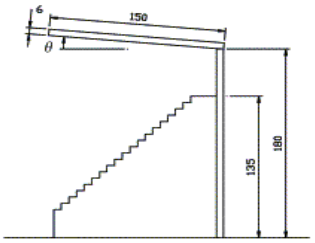


Fig. 6 Light open canopy roof (sports stadium)

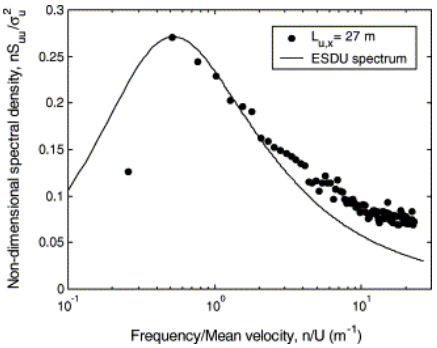


Fig. 7 Power spectra density function

The wind load is presented either as a wind pressure or a wind force. For the steel hall in Fig. 8, we calculated dynamic response due to eccentric wind force $F_w(t)$ (see part 7.3 in 1.):

$$F_w(t) = c_{F,net} \cdot \frac{1}{2} \rho \cdot v^2 \, sin(\omega_i \cdot t) \cdot A_{ref} \quad (4)$$

Harmonic wind force by vibration in resonance with 2nd natural mode (n_2 = 5,101 Hz) was considered normal to the roof with eccentricity d/4 of axis cross-section. Second natural frequency is situated near to power spectra function peak.

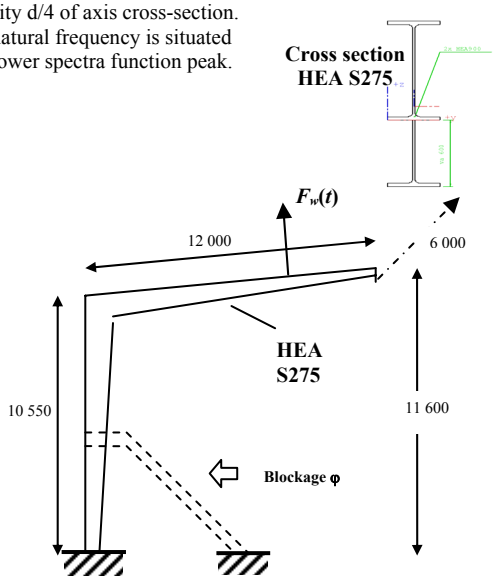


Fig. 8 Open sports stadium roof in Bratislava

Maximal amplitudes of the free end of the roof for the mean wind velocity 10,2 m/s depends on the degree of blockage under canopy. For the empty canopy the max displacement is 0,044 m and for the fully blocked roof the value is 0,068 m (see 8.). Generally, we can say that on the preliminary stage of design of canopy roofs it is possible to find the first and second natural mode out of the maximum power spectra density function and response and minimize wind response.

4 Vortex shedding

The aero-elastic instabilities were observed on large stacks, antennas and light masts, towers, bridge hangers and supports. Vortex shedding should be investigated when the ratio of the largest to the smallest crosswind dimension of the structure (in the plane perpendicular to the wind) exceeds 6. If the cylinder is flexible in cross flow, and natural frequency is near to vortex shedding frequency, exciting force comes into resonance with vibration of cylinder and this effect is vortex resonance. The vortex shedding is highly Reynolds number dependent. There are three typical ranges of flow separation.

1/ subcritical $\mathrm{Re} < 2{,}3 \cdot 10^5$
2/ critical and postcritical $2{,}3 \cdot 10^5 < \mathrm{Re} < 3{,}5{,}5 \cdot 10^6$
3/ transcritical $5 \cdot 10^6 < \mathrm{Re}$

In subcritical and transcritical ranges the flow separation becomes more regular. The exciting force increases and starts vortex-excited vibrations with vortex shedding frequency *n:*

$$n = \frac{St \cdot v}{d} \qquad (5)$$

From equation (5) we can calculate „critical wind speed“, when the vortex shedding may occur:

$$v_{crit} = \frac{n_{(i),y} \cdot b}{St} \qquad (6)$$

where b - width of the structure (perpendicular to the wind direction) for circular cylinder outer diameter
$n_{(i),y}$ - is fundamental frequency of cross-wind vibration of the mode i in [Hz],
St – Strouhal number

4.1 Calculation of the peak amplitude according to EN 1991-1-4

The largest displacement according to E.1.5.2 in 1.is:

$$\frac{y_{F,max}}{b} = K_w \cdot K \cdot c_{lat} \cdot \frac{1}{St^2} \cdot \frac{1}{Sc} \qquad (7)$$

where K_w is correlation length factor (E8) in 1.:

$$K_w = \frac{\int_0^{L_j} \Phi_{i,y}(z)dz}{\int_0^{L_j} \Phi_{i,y}(z)dz} \le 0{,}6 \qquad (8)$$

Constant of the mode shape K (E9) in 1.:

$$K = \frac{\int_0^{L} \Phi_{i,y}(z)dz}{4\pi \int_0^{L} \Phi_{i,y}^2(z)dz} \qquad (9)$$

The exciting lift coefficient c_{lat} depends on Reynolds number (see Tab.E.2 and Fig.E.2 in 1.). Scruton number (see E.4 in 1.):

$$Sc = \frac{2 \cdot m_{i,e} \cdot \delta_s}{\rho \cdot b^2} \qquad (10)$$

Where ρ=1,25 kg/m^3 is air density,
$m_{i,e}$ is equivalent mass per unit length,
$\Phi_{i,y}$ is the mode shape i.

In the Tab.1 there are the structures and their main characteristics sensitive to vortex shedding (see 4.).

Tab.1

Structure.	**m_e [kg/m´]**	**h/b**	**$v_{crit,1,2}$ [m/s]**	**Sc**	**Re**	δ_s
Steel stack I	225	25/1,3	14	2,56	$1{,}2.10^6$	0,012
Steel stack II	442	50/1,8	6,48	2,5	$0{,}7.10^6$	0,012
Concrete chimney	9800	120/4,6	7,2	21,8	$2{,}4.10^6$	0,03
Steel light masts	31	20/0,49÷ 0,25	1,23 7,64	11,0	$2{,}05.10^4$ $1{,}78.10^5$	0,012

In the Tab.2 the maximal resonance displacements in cross wind direction due to vortex shedding are compared (see 4.). Vortex resonance responses were calculated according to (7) for slender and wind sensitive structures. In this case the EN 1991-1-4 is less strict, because vortex shedding mechanism is not uniformly distributed along cylinder axis. The exciting force acts on the correlation length, for the cantilever this length is near the top and increases with increasing amplitude. Comparison of maximal vortex amplitudes due to different codes is in Tab.2

Tab.2

Structure	**EN 1991-1-4**	**Numerical analyses STN 73 0035**
	$y_{F,max(1)}$ [m]	**y_{max} [m]**
Steel stack I	0,249	0,258
Steel stack II	0,265	0,287
Concrete chimney	0,077	0,0795
Steel light masts	0,02	0,0288

5 Conclusion and evaluation

The paper shows that detailed analysis of the wind action, especially for the slender structures and structures with atypical shapes situated near the ground helps us to better understand the wind flow. Results and conclusion in these cases show that it is necessary to take into account stochastic and resonance effect of turbulence intensity. The full dynamical evaluation of a response of sensitive structures is significant for engineer. For structures, which are sensitive to dynamic effects, the calculation procedure could consider critical winds velocities between 5 ÷ 20 m/s (see 2.). To obtain the wind load and response information for the large and slender structures and for the structures situated in regions with special terrain parameters or very cold and stratified flow conditions the wind tunnel tests with appropriate models of the structure and natural wind provide us the design parameters.

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Primary Paper Section: J

Secondary Paper Section: N, M, U

FLATNESS MEASUREMENT BY MULTI-POINT METHODS AND BY SCANNING METHODS

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Abstract: Paper deals with some of the flatness extraction strategies on measurement by means of coordinate measuring machine. There are the choice flatness measurement by multi-point and scanning methods compared. There is the difference in a number of points and on their arrangement and there is also the difference at measurement by multi-point and scanning methods application. There are a single methods considered following a measured flatness values in practice comparison. At the conclusion there are the references in practice pronounced.

Keywords: flatness, measurement, extraction strategy, coordinate measuring machine

Introduction

Machine production`s result are machine parts designed and produced in order to their express function specifications achievement. However, it is impossible to produce ideal products. Therefore, the deviations that are to result on parts surfaces and elements are natural production result [1]. There is a flatness measurement usually applied for example on the tables working surfaces of a planers, milling machines and on the chuck plates of a vertical turning lathes, too. Accordingly, there is a flatness measurement applied on the bed plates of a swing drilling machines and so on. There are a surface plates, straight edges and a levels usually applied for the flatness measurement whereby these equipments are setting on an each other orthogonal directions or on a diagonal directions. For more exacting flatness measurement there are a measuring accuracy bridges and a plates with sensitive dial gauges or a heliotropes applied [2]. It is need to determine by means of measurement these deviations. However, even thought standard STN EN ISO 1101: 2006 [3] does not define the term deviation absolutely. It introduces the term "tolerance zone" that is defined as a circumscribed area by one or more geometrical exact lines or surfaces. This tolerance zone is characterized by linear dimension that is called "tolerance" [1].

1 Flatness

The standard STN EN ISO 1101: 2006 [3] defines the term "flatness tolerance" as a zone that is delimited by two parallel planes with their radial distance equal to value "t".

It appears from this that flatness tolerance determines a limit values of surfaces and of planes and lines symmetries straightness deviations on a flat surface. That means the all points of surface (real point of surface or symmetrical planes) must be found between two parallel planes with their radial distance that is specified by tolerance on mechanical drawing. The distance between two planes must be minimal [1].

There is an urgent request of general need for obtain a measured plane surface that is replaced by profiles or points arrangement and then this surface can be faced with plane (perfect surface) whose position compared with a surface under consideration it is necessary to specify correctly at which a normal size of both surfaces difference is presented as the flatness deviation.

Plane that is faced with measured surface we called that "reference plane". This is defined as associated plane fitting the flatness surface in accordance with specified conventions, to which the deviations from flatness and the flatness parameters are referred. Reference plane can be:

1. *Minimum zone reference planes MZPL:* two parallel planes enclosing the flatness surface and having the least separation (see Fig. 1):
   - *outer minimum zone reference plane:* minimum zone reference plane outside the material;
   - *inner minimum zone reference plane:* minimum zone reference plane inside the material;
   - *mean minimum zone reference plane:* arithmetic mean plane of the minimum zone reference planes.
2. *Least squares reference plane LSPL:* plane such the sum of the squares of the local flatness deviations is a minimum (see Fig. 2) [4].

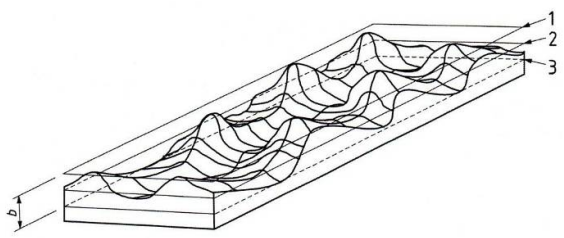

Fig. 1 Minimum zone reference planes (STN P CEN ISO/TS 12781-1: 2008)
b – least separation, 1 – outer minimum zone reference plane, 2 – mean minimum zone reference plane, 3 – inner minimum zone reference plane

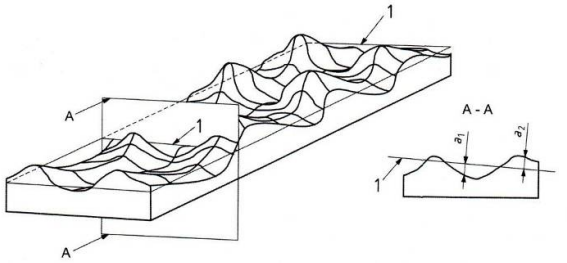

Fig. 2 Least squares reference plane (STN P CEN ISO/TS 12781-1: 2008)
a_1 – negative local flatness deviation, a_2 – positive local flatness deviation, 1 – least squares reference planes

In respect to 3D properties of machine parts (i.e. flatness, cylindricity) it is very difficult to comply with a geometrical accuracy definitions in the course of measurement. The development of machine-industries measuring accuracy technique with its electronic equipment and the growth of software possibilities make them possible more and more to approximate to a geometrical properties definitions in the course of an accuracy to form inspection [5].

2 Flatness measurement

The surface of a plane is an area. An area can be thought of as the combination of two profiles where the directions of the two profiles can be used to establish a coordinate system for the area.

In the case of a plane the two profiles are orthogonal to each other within the plane, with any position on the plane being located by giving its coordinates with respect to its distance in the direction of one profile and distance in other profile`s direction from an origin.

The surface of a plane is an area and so the sampling intervals along the two defined orthogonal directions need to be specified [6].

2.1 Extraction strategies

In order to obtain a reliable assessment of flatness form, an appropriate extraction strategy for obtaining a representative set of points on the workpiece is required. These extraction strategies requests are specified by the standard STN P CEN ISO/TS 12781-2: 2008 [6].

In practice, it is often difficult to achieve a complete covering of the feature of flatness given by the theoretical minimum density of points. In these situations more limited extraction strategies

are employed that give specific rather than general information concerning the assessment of flatness form. These include the

- rectangular grid extraction strategy,
- polar grid extraction strategy,
- specified grid, e.g. “Union Jack” and triangular extraction strategies,
- parallel extraction strategy,
- points extraction strategy [7].

An indication of the ability of each of the extraction strategies to assess harmonics is as follows [6]:

a) Rectangular grid extraction strategy

The main characteristic of the rectangular grid extraction strategy is a high density of points along both the orthogonal profiles. Although this is not a full high-density coverage of the feature of flatness, it does give the extraction strategy the ability to assess the harmonic content in both directions relative to the form content. Hence, this extraction strategy is recommended as the sampling strategy for the assessment of the total feature of flatness.

The extraction strategy consists of equally spaced straightness profiles in two orthogonal directions to form a rectangular grid (see Fig. 3).

b) Polar grid extraction strategy

The main characteristic of the polar grid extraction is a high density of points along both the radial and roundness profiles. Although this is not a full high-density coverage of the feature of flatness, it does give the extraction strategy the ability to assess the harmonic content in both the radial and circumferential directions relative to the form content. Hence, this extraction strategy is recommended as the sampling strategy for the assessment of the total feature of flatness that is nominally a disk.

The extraction strategy consits of equally spaced concentric circular profiles about a defined centre together with equally angled radial straightness profiles through the defined centre to form a polar grid (see Fig. 4).

c) Specified grid extraction strategy “triangular grid extraction strategy”

The main characteristic of the triangular grid extraction strategy is a high density of points along the profiles which define the “triangular grid”. Although this is not a full high-density coverage of the feature of flatness, it does give the extraction strategy the ability to assess the harmonic content in the directions defining the triangular grid relative to the form content. Hence, this extraction strategy is recommended as the sampling strategy for the assessment of the total feature of flatness as an alternative to the rectangular grid and polar grid extraction strategies.

The extraction strategy consists of equally spaced straightness profiles in three directions 60° apart form each other to form a triangular grid (see Fig. 5).

d) Specified grid extraction strategy “Union Jack extraction strategy”

Although this is not a full high-density coverage of the feature of flatness, it does give the extraction strategy a limited ability to assess the harmonic content in the directions defined by the “Union Jack” relative to the form content. This extraction strategy is limited by the small number of profiles used and the large areas not sampled. Hence, this extraction strategy ahould be used only if the longer wavelength content of the feature of flatness is negligible, where it is a quick extraction strategy. The rectangular, polar and triangular extraction strategies are recommended, before the Union Jack extraction strategy, as the sampling strategy for the assessment of the total flatness if the wavelength content of the surface is not known a *priori*.

The extraction strategy consists of a series of a grid with three profiles in each direction together with two straightness profiles across the main diagonals of the grid to form a “Union Jack” (see Fig. 6).

e) Parallel extraction strategy

The main characteristic of the parallel extraction strategy is a higher density of points in the direction of the profile relative to the density of points orthogonal to the profile. This gives the extraction strategy the ability to assess very much higher harmonic information in the direction of the profile in comparison to harmonic information orthogonal to the profile. Hence, this extraction strategy is recommended only if high harmonic information is of interest in one direction compared to the direction orthogonal to it.

The extraction strategy consists of equally spaced straightness profiles in one specified direction to form a series of parallel profiles (see Fig. 7).

f) Points extraction strategy

The density of points is typically lower than with the other extraction strategies listed in above. This restricts the ability to assess the harmonic content of a feature of flatness. The lower number of points also presents problems when filtering. It is for this reason that the points extraction strategy is not recommended unless only approximate estimates of the flatness parameters are required.

The extraction strategy consists of points taken at random or patterned on the flatness surface (see Fig. 8).

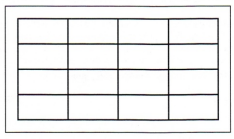

Fig. 3 Rectangular grid extraction strategy (STN P CEN ISO/TS 12781-2: 2008)

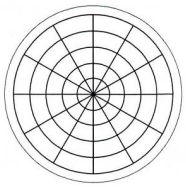

Fig. 4 Polar grid extraction strategy (STN P CEN ISO/TS 12781-2: 2008)

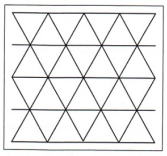

Fig. 5 Specified grid extraction strategy “triangular grid extraction strategy” (STN P CEN ISO/TS 12781-2: 2008)

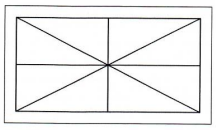

Fig. 6 Specified grid extraction strategy “Union Jack extraction strategy” (STN P CEN ISO/TS 12781-2: 2008)

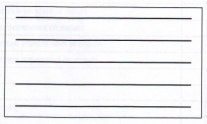

Fig. 7 Parallel extraction strategy (STN P CEN ISO/TS 12781-2: 2008)

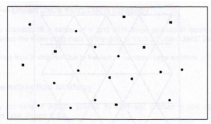

Fig. 8 Points extraction strategy (STN P CEN ISO/TS 12781-2: 2008)

3 Experimental work

For variously flatness measurement by multi-point methods and by scanning methods of outer plane surface experimental work there was a component part with its 300 x 250 mm dimensions. A flatness measurement on this component part was realized by means of coordinate measuring machine ZEISS PRISMO NAVIGATOR 5 that was controlled by means of operating software ZEISS CALYPSO 4.4.04.01, too. A component part`s plane surface was measured by several *multi-point methods* and by several *single points instantaneous positions continuous scanning methods*:

1. Measurement by multi-point methods – there were applied: coordinate measuring machine ZEISS PRISMO NAVIGATOR 5, operating software ZEISS CALYPSO 4.4.04.01

- *rectangular distribution of 50 points in 10x5 arrangement* – there was a sensor with radius of 1 mm applied;
- *rectangular distribution of 72 points in 9x8 arrangement* – there was a sensor with radius of 1 mm applied;
- *rectangular distribution of 100 points in 10x10 arrangement* – there was a sensor with radius of 2,5 mm applied.

2. Measurement by single points instantaneous positions continuous scanning methods – there were applied: coordinate measuring machine ZEISS PRISMO NAVIGATOR 5, operating software ZEISS CALYPSO 4.4.04.01
   - *parallel profile extraction strategy in number of 2000 points* – there was a sensor with radius of 1 mm applied;
   - *parallel profile extraction strategy in number of 7500 points (it was realized in a direction of X-axis)* – there was a sensor with radius of 2,5 mm applied;
   - *parallel profile extraction strategy in number of 7500 points (it was realized in a direction of Y-axis)* – there was a sensor with radius of 2,5 mm applied;
   - *triangular grid extraction strategy in number of 2000 points* – there was a sensor with radius of 1 mm applied.

There is a single flatness deviations measurement by multi-point methods and by single points instantaneous positions continuous scanning methods summary of results listed in Tab. 1.

Tab. 1 Flatness results and flatness measurement results comparison

Flatness measuremnt by multi-point methods and by scanning methods	***Δ [μm]***	***Δ* [%]***
Rectangular distribution of 50 points in 10x5 arrangement	2	*28,6*
Rectangular distribution of 72 points in 9x8 arrangement	2	*28,6*
Rectangular distribution of 100 points in 10x10 arrangement	3	*42,9*
Parallel profile extraction strategy in number of 2000 points	27	*385,7*
Parallel profile extraction strategy in number of 7500 points in a direction of X-axis	9	*128,6*
Parallel profile extraction strategy in number of 7500 points in a direction of Y-axis	6	*85,7*
Triangular grid extraction strategy in number of 2000 points	7	*100*

Nommenclature:
Δ – measurement by multi-point methods and by scanning methods results
Δ* - measurement by multi-point methods and by scanning methods results comparison in percentage statement [(Δ / $\Delta_{\text{triangular grid extraction strategy}}$) . 100%]

An above-mentioned flatness measurement by multi-point methods and by scanning methods were on each other compared whereby measurement by means of triangular grid extraction strategy was considered to be the reference measurement forasmuch as it was consisted of equally spaced straightness profiles in three directions 60° apart from each other to form a triangular grid that is considered to be the sampling strategy for the assessment of the total feature of flatness as an alternative to the rectangular grid extraction strategy in this case. Tab. 1 also presents an above-mentioned measurement by multi-point methods and by scanning methods results comparison with reference measurement in a percentage statement.

There are the above-mentioned different applied flatness measurement methods graphical outputs listed in the following undermentioned figures.

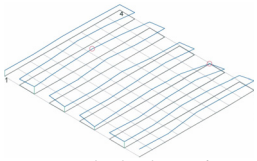

Fig. 9 Rectangular distribution of 50 points in 10x5 arrangement

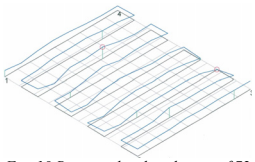

Fig. 10 Rectangular distribution of 72 points in 9x8 arrangement

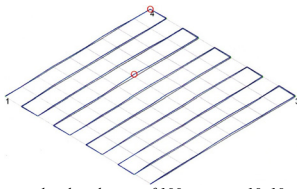

Fig. 11 Rectangular distribution of 100 points in 10x10 arrangement

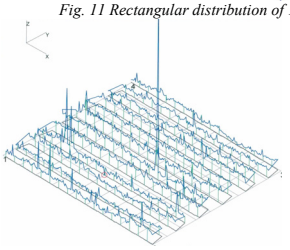

Fig. 12 Parallel profile extraction strategy in number of 2000 points

Fig. 13 Parallel profile extraction strategy in number of 7500 points in a direction of X-axis

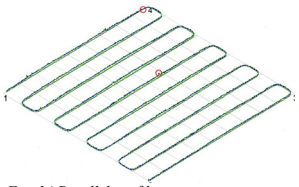

Fig. 14 Parallel profile extraction strategy in number of 7500 points in a direction of Y-axis

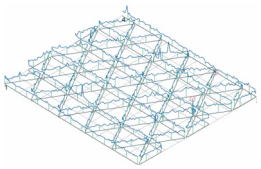

Fig. 15 Triangular grid extraction strategy in number of 2000 points

Conclusions

Measured flatness results that were obtained by the above-mentioned different applied flatness measurement methods we can summarize as follows:

- There were the least flatness values by means of measurement by multi-point methods (i.e. by rectangular distribution of 50 points in 10x5 arrangement and rectangular distribution of 72 points in 9x8 arrangement and by rectangular distribution of 100 points in 10x10 arrangement, too) and they were equalled less than in compare with reference measurement (i.e. by triangular grid extraction strategy in number of 2000 points). These values were in the concrete equalled 28,6 till 42,9 percentage of measurement by means of triangular grid extraction strategy value. These percentual results are consequent on a low number of measured points.
- In the case of measurement by means of parallel profile extraction strategy in number of 2000 points there is an expressive failure that it can be seen in Fig. 12. There was a flatness value in the concrete equalled 3,86 times more than in compare with measurement by means of triangular grid extraction strategy what is as mucha s 385,7 percentage of this reference measurement. Therefore, there is an urgent request of general need for remove this result from additional obtained values processing.
- In the case of measurement by means of parallel profile extraction strategies in number of 7500 points that were realized in a direction of X-axis and in a direction of Y-axis there were a flatness surfaces results approximated to the triangular grid extraction strategy result. These flatness values were in the concrete equalled 85,7 till 128,6 percentage of measurement by means of triangular grid extraction strategy value.
- In the case of measurement by means of triangular grid extraction strategy in number of 2000 points there is a sufficient in numbers of points and an appropriate of points arrangement, too. There is not a flatness measurement density by an expressive failure. Hence, this flatness measurement by means of triangular grid extraction strategy is possible to

consider it as a convenient and an accurate flatness measurement. From the above-mentioned this extraction strategy gives its the ability to assess the harmonic content in the directions defining the triangular grid relative to the form content. Hence, this extraction strategy is recommended as the sampling strategy for the assessment of the total feature of flatness as an alternative to the rectangular grid extraction strategy in this case.

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Primary Paper Section: J

Secondary Paper Section: JB, JS