CER Comparative European Research 2016

Proceedings | Research Track

of the 5th Biannual
CER Comparative European Research
Conference

International Scientific Conference for Ph.D. students of EU countries

March 28-31, 2016 | London

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Introduction

The conference Proceedings you are holding is a collection of selected peer-reviewed texts presented at the international scientific conference Comparative European Research - CER 2016 (March 28-31).

The biannual international scientific conference is organized under the auspices of the SCIEMCEE scientific platform every March and October and follows up on activities aimed at providing greater support for the scientific activities of Ph.D. students and beginning researchers. The various biannual CER conferences represent a space for the international assessment of the qualitative standard of scientists and the results achieved by the various academic institutes. The CER conference is an ideal place for comparing the standard of scientific work, particularly on a European scale.

The Proceedings from the 2016 CER conference contains several dozen academic texts whose main purpose is the presentation and sharing of knowledge always in one of nine conference sections. The conference Proceedings prioritize only those articles which are good enough to offer readers new insights into the issues analyzed, or which extend the known boundaries of science. The guarantor of the CER 2016 conference is a signatory of the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, and therefore all papers are made available to professionals and the general public via OpenAccess.

The conference committee, comprising experts from several university departments, believes that the CER international scientific conference will attract an ever wider base of participants to join in the discussions and will stimulate further scientific work and interdisciplinary development.

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ALTERNATIVE DISPUTE RESOLUTIONS IN THE ELECTRONIC COMMUNICATIONS MARKET

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Abstract: *The regulation establishes a system of alternative dispute resolution of consumer disputes. The system of alternative dispute resolution offers consumers a way of resolving their disputes with businesses. This measure in the Czech electronic communications market involves the Czech Telecommunication Office that is the competent body for resolving disputes in the field of electronic communications and postal services and the Czech Trade Inspection that is responsible for resolving disputes in the field of the content of mentioned services and the purchase of telecommunication equipment. The outcome of ADR at the CTO is binding. In contrast, the proceedings at CTI is a conciliation, during which the parties are encouraged to settle the dispute by an independent mediator. The possible outcome is a private settlement agreement between the parties. It is not enforceable, but parties should have an easier position in possible court proceedings. Both ADR entities are linked to the European online dispute resolution platform for resolving consumer disputes online. The aim of this platform is to help consumers solve cross-border disputes of online purchases and service contracts.*

Key words: *alternative dispute resolutions, online dispute resolution, electronic communications, consumer protection, EU internal market*

1. Introduction

The reason for specific procedures to be introduced is that, in most cases, it would be too expensive for consumers to litigate against undertakings.[1] Ensuring access to simple, efficient, fast and low-cost ways of resolving domestic and cross-border consumer disputes which arise from sales or service contracts should benefit consumers and therefore boost their confidence in the EU internal market. That access should apply to online as well as to offline transactions, and is particularly important when consumers shop across borders. Fragmentation of the EU internal market is detrimental to competitiveness, growth and job creation within the EU. Eliminating direct and indirect obstacles to the proper functioning of the internal market and improving citizens' trust is essential for the completion of the EU internal market.

For the purpose of a simple, fast and low-cost out-of-court solution to disputes between consumers and entrepreneurs in the electronic communications market, Directive 2013/11/EU of the European Parliament and of the Council of 21 May 2013 on alternative dispute resolution for consumer disputes (hereinafter the "ADR Directive"), Regulation EU 524/2013 of the European Parliament and of the Council Of 21 May 2013 on online dispute resolution for consumer disputes (hereinafter the "ODR Regulation") and Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (hereinafter the "Universal Service Directive") were adopted.

The ADR Directive and the ODR Regulation are two interlinked and complementary legislative instruments. The ODR Regulation provides the establishment of an online dispute resolution platform (hereinafter the "ODR platform") which offers consumers and entrepreneurs a single point of entry for the out-of-court resolution of online disputes, through ADR entities which are linked to the platform and offer ADR through quality ADR procedures. The availability of quality ADR entities across the EU is a precondition for the proper functioning of the ODR platform.

2. New Information Duties of Entrepreneurs

Entrepreneurs established on the EU territory shall inform consumers about the ADR entity or ADR entities by which those entrepreneurs are covered, when those entrepreneurs are obliged to use those entities to resolve disputes with consumers.[3] That information shall include the website address of the relevant ADR entity or ADR entities.

In the Czech Republic, the ADR entities in the electronic communications market for the provision of publicly available electronic communications service is the Czech Telecommunication Office (*in Czech Český telekomunikační úřad*) and for the content of these services and the purchase of telecommunication equipment is the Czech Trade Inspection (*in Czech Česká obchodní inspekce*).[4][5]

The information about the ADR entities shall be provided in a clear, comprehensible and easily accessible way on the entrepreneurs' website, where one exists, and, if applicable, in the general terms and conditions of sales or service contracts between the entrepreneur and the consumer. In cases where a dispute between a consumer and an entrepreneur could not be settled further to a complaint submitted directly by the consumer to the entrepreneur, the entrepreneur shall provide the consumer with the information about the ADR entities, specifying whether he will make use of the relevant ADR entities to settle the dispute. That information shall be provided on paper or on another durable medium.

Entrepreneurs engaging in online sales or service contracts shall further inform consumers about the existence of the ODR platform and the possibility of using the ODR

platform for resolving their disputes. They shall provide an electronic link to the ODR platform on their websites (that link shall be easily accessible for consumers) and, if the offer is made by e-mail, in that e-mail. The information shall be also provided, where applicable, in the general terms and conditions applicable to online sales and service contracts. Entrepreneurs engaging in online sales or service contracts shall also state their e-mail addresses.
When entrepreneurs are obliged to provide both above mentioned information, they shall, where possible, provide that information together.
In the Czech Republic, the rule on penalty applicable to infringements of the provisions on the above mentioned information duties of CZK 1,000,000 (circa EUR 40,000) at maximum were laid down as effective, proportionate and dissuasive.

3. ADR at the Czech Telecommunication Office (CTO)
The CTO resolves disputes between entrepreneurs on the one hand and consumers on the other, on the basis of a motion filed by any of the parties to the dispute, as far as the dispute relates to obligations imposed by, or on the basis of, the Act on Electronic Communications.
An administrative fee in the amount of CZK 100 (circa EUR 4) is charged for the presentation of the motion at the request of consumer and in the amount of 4% of disputable amount, CZK 200 (circa EUR 8) at least is charged for the presentation of the motion at the request of entrepreneur regarding financial settlement.
The motion of entrepreneurs that refers to the consumer's obligation regarding financial settlement shall be filed on an electronic form. The CTO makes these forms available in a manner allowing remote access.
In the notice of initiation of the ADR at the consumer's request, the CTO shall inform the parties on the right to legal assistance and that they are not obliged to legal representation. Submitting a proposal consumer agrees with the legal effects of the outcome of the ADR.

3.1 Prerequisites for ADR
The consumer is entitled to raise a claim in respect of the billing of the price or a claim in respect of the publicly available electronic communications service provided to him.
The consumer is entitled to raise a claim in respect of the billing of the price without undue delay no later than 2 months after the date of delivery of the bill containing the price for the service provided, otherwise the entitlement to raise a claim shall lapse. If no bill is delivered because of the type of service provided (e.g. pre-paid services), the consumer is entitled to raise a claim within 2 months of the provision of the service. The filing of a claim does not have a suspensive effect; however, in justified cases the CTO may, if so requested by the consumer, decide that the filing of a claim has a suspensive effect.
The consumer is entitled to raise a claim in respect of the provided service without undue delay no later than 2 months after the date of faulty provision of service; otherwise the entitlement to raise a claim shall lapse.
If the entrepreneur fails to meet an above mentioned consumer claim, the consumer is entitled to file with the CTO a motion to initiate ADR in respect of objection against the settlement of a claim, which the consumer shall do without undue delay but no later than 1 month after the delivery of the claim settlement.[2] This motion does not have a suspensive effect again; however, in justified cases the CTO also may, if so requested by the consumer, decide that the motion has a suspensive effect.

3.2 Deadline for Issuing a Decision
The deadline for issuing a decision in a dispute initiated at the request of entrepreneur is 4 months, in particularly complex cases 6 months. The deadline for issuing a decision in a dispute initiated at the request of consumers is 90 days. This period may be extended at particularly complex disputes. In such a case, parties must be promptly informed of any extension and the total time to when to expect a decision.

3.3. Appeal against the Decision of CTO
Against the ADR decision issued in the first instance of CTO, the party has the right to appeal within 15 days from the date of delivery of this decision. The appeal is decided by the chairperson of the CTO. In the Czech Republic, these outcomes of the ADR in the electronic communications market is legally binding for both parties. Nevertheless, these decisions of the Chairman of the CTO on the appeal are reviewable by the courts in civil proceedings.

3.4 Compensation for the Costs of ADR
The CTO awards to the party who fully succeeded in the proceedings a compensation for the costs required for effective enforcement of rights against the losing party to the proceedings.
In the event that a party succeeded only partially in the proceedings, the CTO may split the compensation for the costs to appropriate proportions, or may decide that neither of the parties is entitled to such compensation. Even in the case that a party succeeded only partially the CTO may award full compensation for such costs to such a party provided that such a party was unsuccessful in only a negligible part of the proceedings or that the decision on the amount to be discharged depended on an expert opinion or was at the discretion of the CTO.
The CTO also awards a compensation for the costs in full to the party who has withdrawn the reasonable motion because of a subsequent behaviour of the other party.

4. ADR at the Czech Trade Inspection (CTI)
The CTI resolves disputes in the electronic communications market between entrepreneurs on the one hand and consumers on the other, on the basis of a motion filed by a consumer, as far as the dispute relates to the purchase of telecommunications equipment or the content of electronic communications services.
The motion may be presented exclusively by a consumer and there is no administrative fee for the presentation of the motion.

4.1 Prerequisites for ADR

The consumer has the right to ADR of consumer disputes related to sales or service contracts with the exception of contracts concluded non-economic services of general interest, health services provided by health professionals to patients to assess, maintain or restore their state of health, including the prescription, dispensation and provision of medicinal products and medical devices and public providers of further or higher education.

The consumer is entitled to file the motion to the CTI within one year from the date upon which the consumer submitted the complaint to the entrepreneur first.

The motion shall contain identification of the parties to the dispute, complete and understandable statement of the facts, an indication of what the consumer claims, the date when the consumer raise a claim at the entrepreneur first, a statement that the case has not been ruled by a court, arbitration and is not a subject of such proceedings, date and signature of the consumer.

The CTI is allowed to refuse to deal with a presented consumer dispute on the grounds that the consumer did not attempt to contact the entrepreneur in order to discuss the complaint and seek, as a first step, to resolve the matter directly with the entrepreneur. The motion shall be accompanied by proof of the fact that the consumer failed to resolve the dispute with the entrepreneur directly.

The CTI is also allowed to refuse to deal with a presented consumer dispute on the grounds that the dispute is frivolous or vexatious.

4.2 Deadline for Issuing a Decision

The entrepreneur shall within 15 working days from delivery of the CTI notification provide the CTI with an answer to facts mentioned in the consumer motion. The entrepreneur is further obliged to cooperate closely with the CTI for the efficient conduct of ADR of consumer disputes.

In the Czech Republic, the rule on penalty applicable to infringements of the provisions on the above mentioned cooperation duties of CZK 1,000,000 (circa EUR 40,000) at maximum were laid down.

The outcome of the ADR procedure at the CTI is made available within a period of 90 calendar days from the date on which the CTI has received the complete motion. In the case of highly complex disputes, the CTI may, at its own discretion, extend the 90 calendar days' time period. The parties shall be informed of any extension of that period and of the expected length of time that will be needed for the conclusion of the dispute (but no more than other 90 days).

4.3 Legal Aspects of ADR at CTI

In the Czech Republic, the outcome of ADR at CTI is dependent on the will of the parties to the dispute and it is also called a gentleman agreement because it is not enforceable comparing to a court judgment in force.

Within this procedure, no compensation for the costs of proceeding is awarded and each of the parties to the dispute bears its own costs.

It is also necessary to draw attention to the fact that ADR proceeding pauses running of the limitation periods.

5. ODR Platform

For consumer disputes of online sales or service contracts, the ODR platform may be used. Upon delivery of a fully completed complaint form, the ODR platform shall, transmit it to the respondent party with the information about inter alia the ADR entity or entities which are competent to deal with the complaint and the fact that the parties have to agree on an ADR entity in order for the complaint to be transmitted to it.

The ODR platform shall automatically and without delay transmit the complaint to the ADR entity that the parties have agreed to use. The ADR entity which has agreed to deal with a dispute shall conclude the ADR procedure. Where the parties fail to agree within 30 calendar days after submission of the complaint form on an ADR entity, or the ADR entity refuses to deal with the dispute, the complaint shall not be processed further by this platform.

6. Conclusion

Alternative dispute resolutions in the electronic communications market should ensure that all disputes between consumers and entrepreneurs which arise from the provisions of services or sale of goods can be submitted to an ADR entity. Entrepreneurs should provide consumers with information regarding the ADR of consumer disputes. On the other hand, before presenting a motion to an ADR entity, consumers should contact entrepreneurs by any appropriate means, with the aim of resolving the dispute amicably.

In case of online purchase of goods or service contracts, the ODR platform should build on existing ADR entities to which a consumer motion should be transmitted through this platform. The effectiveness should be increased by the rule ensuring that such dispute resolution does not require the physical presence of the parties before the ADR entity.

These measures should contribute to the attainment of a high level of consumer protection and the effectiveness of EU internal market.

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THE AGENCY THEORY AND RESOURCE BASED THEORY IN CONTEXT WITH FAMILY BUSINESSES

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Abstract: *Family business research has grown in the past. In many countries family businesses form the majority of firms. First theories and the different levels of analysis in family business studies are . First the agency theory is used to explain relations in firms. Altruism and entrenchment are the major differences between family and non family firms. They can have positive and negative effects on family firms. Secondly the resource based view of the family firms is discussed. Herby the entrepreneurial attitude may be the key to success in family firm succession. The resource based view helps to explain the possession of resources which could lead to competitive advantages and explains how family resources have been or can be acquired through family involvement. The different levels of family involvement are analyzed in a next step. Herby the separation in circles, the F-Pec scale and the Substantial Family Influence (SFI) are discussed. Then family firm may be characterized as having both financial and non financial goals.*

Keywords: *family business, agency theory, resource based view, level of familiness, financial and nonfinancial goals,*

1. Introduction

Family business research is a rather young field because it has only intensified in the 1990s. In most industrialised countries family businesses form the majority of firms. Family business scholars have so far focused on the processes of business succession and professionalization. Further more different approaches have evolved to analyse the lifecycle stages of family businesses and the premise that a family business remains as such and does not develop into a non family business. There is empirical evidence that the share of family businesses among larger companies is significantly smaller than that among small and medium-sized companies. This means the larger a company grows the more likely it is that a significant amount of family businesses become non-family businesses and family influence is likely to diminish gradually. The family influence is a family-business specific resource, which explains the performance difference in family businesses and non family businesses [1].

2. Theories and level of analysis in family business studies

Strategic management, organizational theory, economics, sociology, anthropology, and psychology are some of the many promising approaches used by researchers to study family firms.

The ultimate aim of the field of family business studies is to develop “theories of family firms” that consider the reciprocal relationships between family and business systems. Therefore a starting point is to reexamine the current theories in the family and organizational fields to test the extent of their validity when these two systems are intertwined [9].

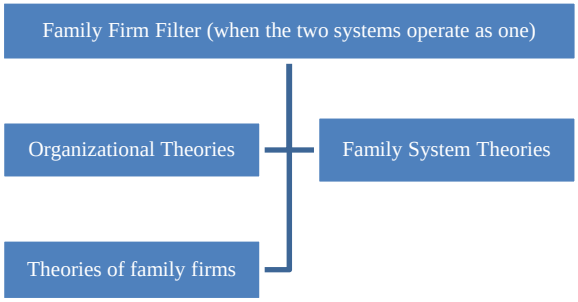

Figure 1 Toward the development of theories of family firms [3]

The family business literature can be organized according to the individual, the interpersonal/group level, the organisational level and the societal/environmental level [3].

On the individual level reasearch has been done concerning the founders, the next generation, women and nonfamily employees. One theory in use is the social network theory which argues that the founder has a significant influence on the culture, values and performance. Different adaptive leadership styles are used by the next generation. The principal agent theory and the stewardship theory may be of use when looking at the relationship with nonfamily employees.

On the interpersonal or group level contractual agreements, sources of conflicts and management and intergenerational transitions have been analysed. The theories used in this circumstances are variants of agency theory as well the resourc-based view of the firm. The latter states the importance of transferring tacit knowledge, networks and social capital as well as passion, which then should lead to a competitive advantage.

On an organizational level the resource based theory is used as well. Types of sources identified on this level are human, social survivability, patience and governance

structures. It is important to understand the beliefs and culture.
On an organizational level the impact of the fiscal system has been analysed and the institutional theory, contingency theory at the the structural level and the transaction cost theory of Williamson at the ecological level have been used.
Even though it is possible to theorize across multiple levels, most of the literature has focused on one level rather than the complex domain of multiple-level theorizing [3].
In the following two strategic management oriented explanations which are the agency and resource based view will be used.
Both approaches have a performance orientation and assist in explaining important strategic management issues such as formulation and content of goals and strategies, strategy implementation and control, leadership and succession in family firms [2].

2.1 Agency Theory and family business

On the individual level the agency theory is used to explain relationships. Agency costs arise due to conflicts of interest and asymmetric information between two parties to a contract [16]. This theory can be applied on the capital structure decision of the firm. Here agency costs can be defined as to include all actions by an agent that are contradictory to the interests of a principal plus all activities, incentives, policies, and structures used to support the interests and actions of agents with the interests of principals.
Researchers proposed that altruism and the tendency for entrenchment are the fundamental differences in terms of agency costs between family and nonfamily firms [2]. The economics literature [17] showed that that a tendency toward altruism can lead to a problem of self-control and create agency cost in family firms due to a lack of planning, a given perception of a child's performance, difficulty in enforcing a contract and generosity in terms of perquisite consumption. These researchers argued that agency problems cannot controlled easily because family members are residual owners of the firm. However if both family owner and family manager are altruistic toward each other, reciprocal, and altruism is equally strong agency problems can diminish [18]. Family businesses with reciprocal altruism have a competitive advantage in following certain business opportunities as they will have lower reservation prices for those business opportunities [12]. Altruism can lead to the result that family members are willing to suffer from short-term deprivation for a long-term firm survival, to reach low overheads, be flexible in decision making and to reduce bureaucratic processes to a minimum. These can lead to a competitive advantage. Especially in environments of scarcity characterized by low entry barriers and labor-intensive production costs this could help to explain the dominance of family firms in service industries, small-scale manufacturing and franchising environments where margins are low and labor costs high.
Agency issues in family firms have broad implications. Altruism and entrenchment can have positive and negative effects on family firm performance. The generation managing the firm, the extent of ownership control, corporate and business strategy and the industry appear to have some influence on whether the influence is positive or negative.

2.2. Resource-based view of the family firm

An important question in the process of establishing a theory of the family firm is whether family involvement leads to a competitive advantage or not. The answer to this question will provide some understanding why family firms exist and why they are of particular scope and scale [2].
The resource-based view helps to identify the resources and capabilities that make family firms unique and allows them to develop family-based competitive advantages [10]. This view suggests that valuable, rare, imperfectly imitable, and nonsubsitutional resources can lead to sustainable competitive advantage and superior performance [11]. Sirmon and Hitt outlined five sources of family firm capital:
1. Human
2. Social
3. Survivability
4. Patient
5. Governance structures.

These five sources allow family firms to develop competitive advantages. Additionally Carney described three characteristics of family firm governance (parsimony, personalism, and particularism) which lead to cost advantages , help in the development of social capital, and encourage entrepreneurial investments [12]. Another study of large, long-living family firms showed that continuity and the ability to institute changes without influence or control from outside enables family firms to generate and make exceptional long-term use of patient strategies and relationships with stakeholders. Some resources such as human resources may have negative impacts on economic performance [13].
Zahra, Hayton, and Salvato [14] observed that the relationship between entrepreneurship and the cultural dimension of individualism is nonlinear, which means that too little individualism discourages the recognition of radical innovation while too much inhibits the trust, acceptance, and cooperation required to adopt the innovation. They found out that the relationships between entrepreneurship and three other cultural dimensions as the external orientation, distinctive familiness and long-versus short-term orientation are linear and positive.
The entrepreneurial attitude, as a resource, and abilities in a successor may be the key to success in family firm succession. There is evidence that integrity and commitment are more important to the selection and success of a successor than technical skills [2].
Cabrera-Suárez, Saá-Pérez & Garcia-Almeida [15] used the resource and knowledge-based theories to advance the conept of tacit knowledge transfer in succession. They defined it as situation-specific knowledge that is gained through experience and actions. This knowledge is far

more difficult to transfer than explicit knowledge because this one is based on facts and theories which can be articulated and codified.
The resource based view helps to explain the possession of resources which can lead to competitive advantages and shows how family resources have been or can be acquired through family involvement (e.g. the development of tacit knowledge) [2].

3. The levels of familiness

It is important to define the family business exactly when comparing data. The involvement of the family or the so called level of familiness measures how much or how strong the family is involved in the business. Herby the level of family influence ranges from no influence to a maximum influence.
Depending on where the business is in its life cycle different criteria which can distinguish between these businesses are percentage of ownership, strategic control, involvement of multiple generations and the intention to keep the business in the family.
One way herby is to separate the level of influence in three circles. The outer circle requires only some family participation in the business and involvement in business's strategic direction. The middle circle requires that the business owner intends to pass on the business to another member of family and that the founder or descendant runs the company. In the narrowest definition multiple generations have a significant influence on the business [4].
Another way to asses the "familiness" of a firm is the F-PEC scale where the three subscales power, experience and culture are used to distinguish. It enables the assessment on a continuous scale rather than restrict its use as a categorical variable. The power subscale measures if there is a direct or indirect ownership. Furthermore the numbers of family vs. nonfamily members in the governance and management board are compared. In the F-Pec questionnaire the experience dimension is determined by the question what generation owns the company and what generation manages the company or participates actively in the business. Additionally the number of contributing and interested family members is asked. The subscale culture indicates - on a scale from 1 to 5 (not at all … to … to a large extent) – which influence the family has on the business, if the values of the family members are the same or if the family and business values are the same and shared [5]. The commitment is a result of different questions regarding the effort, the support of the family, the loyalty, the compatibility of values, the proudness and other factors concerning the relation to the company.
Lindow found that the power dimension of the F-PEC scale shows a significant correlation with organizational structure [6].
The power dimension was introduced by Klein and termed "Substantial Family Influence "SFI". It distinguishes between family and non-family businesses. The "level of family influence" consists of family ownership, family management and family directorship [7]. The SFI formula:

$$If\ Sfam > 0 => SFI:\ \frac{Sfam}{S\ total} + \frac{MoSB\ fam}{MoSB\ total} + \frac{MoMB\ fam}{MoMB\ total} \geq 1$$

S	= stock
SFI	= substantial family influence
Fam	= family member
MoSB	= members of supervisory board
MoMB	= members of management board

The SFI score can be calculated by the addition of the family's share in stock members of the management board and members of supervisory board. As a result it ranges from 0 (no family influence) to 3 (maximum family influence). Klein defined a family business as a firm that has an SFI score of at least 1 and some family ownership in the firm. The SFI score shows a strong connection with the organisational structure of the firm, has fewer questions than the F-PEC and is often used in the German speaking area [1]. Three levels can be distinguished

1. A firm that has an SFI score between 2 and 3 is referred to as a firm that has a high level of family influence.
2. A firm that has an SFI score between 1 and 2 is referred to as a firm that has a medium level of family influence.
3. A firm that has an SFI score between 0 and 1 is referred to as a firm that has a low level of family influence.

First level firms include all firms that are newly founded by individuals or families, because they are regularly both owned and managed by family members. More mature firms can have also a high level of family influence. If, for example, a family holds all shares and supervisory board members and the management board consists of one family manager and one non-family manager, the result is an SFI score of 2,5. A second level firm that has medium level of family influence may have an SFI score of 1,5 if a family holds the entire share in a firm and half of the firm's directorships, but is managed entirely by non-family members. The third level firm is one that has lost most of its family-business-specific characteristics and may be seen as non-family-business with a small fraction of family ownership and management teams that consist entirely of professionals that own only small share's of the firm's equity.
The SFI score is a simple way to measure family influence and therefore it has certain shortcomings. Firstly it measures family influence at a certain point in time. Secondly it does not include historical or future developments. Additionally the SFI score only covers the influence of equity owners in the firm and not that of creditors such as banks or corporate bondholders.

3.1. Combination of financial and non-Financial goals

Goals and priorities of the family and business systems may not be complementary. Family goals are created and supported by family members. Business goals are for example to make profit, increase the market share be more efficient or other economic goals. Therefore family firms may be characterized as having both financial and non-financial goals. The emotional attachment to family issues

may distract from a firm's focus on purely financial goals. In such situations, non-financial goals often become equally or more important than financial goals. Non-financial goals in family firms include family harmony, family employment opportunities, corporate independence and privacy, cross-generational sustainability and management succession. High levels of family ownership empower the family as the ultimate authority and allow the family to reflect its vision on the business. The family firm's tendency to hold non-financial goals increase when family ownership increases. Studies show that with higher family ownership, goals change towards greater independence and private wealth. As a result family firms are expected to take both economic and (family-centered) non-financial goals into account while making business decisions. It seems that strategic and structuring decisions are made in order to achieve these combined financial and non-financial goals. Therefore it can be assumed that the family is expected to influence strategic and structuring decisions indirectly through their idiosyncratic goal setting [8].

4. Strategic renewal

The above mentioned theories can be used to analyze the influence of familiness on decisions concerning financial and non financial factors. What interests me is the question how the familiness affects management decisions in a narrower sense, as for example the choice and change of legal form – which can lead to a strategic renewal - the effect of taxes and other financial factors.

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URBAN PROFILING - ASPECTS OF PROFILE ORIENTED MARKETING AND ADAPTION MANAGEMENT IN CONJUNCTION WITH CITIES AND THEIR SUSTAINABLE URBAN SOCIO-ECONOMIC DEVELOPMENT

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Abstract: *Cities are the carriers and pioneers of socio-economic change and diverse development trends. The impact of globalization and the demographic change shows a significant, unambiguous direction. Therefore cities definitely need clearly structured and consistent development plans. In this context demands in reference to the planning and usage of urban living space of cities are increasing and require the use of new profiling systems. The main purpose of this paper is to provide an empirical evidence and give a short insight in the complex coherence and their important role to position and improve in an effective way the uniquely and competitiveness of a city in a dynamic global environment among cities around the world in conjunction with an profile oriented marketing systems so that city and public manager can foster a clearly structured future vision and profile for an innovative, competitive and sustainable urban developmental planning to guarantee a high quality of living for their inhabitants to live and work in. This future oriented development, create a challenging situation for the diverse districts. With the help of systematic, dynamic development processes the goal can be achieved. Firstly you have to figure out, how you can link and implement profile oriented marketing and adaption management. Therefore you have to clear the question, is adaption management important to profile oriented marketing and development systems? The Answer is: Yes, it is! Adaption management is a valuable tool and significantly correlated with sustainable marketing development procecses*.

Keywords: *adaption management, urban/city development, planning process, profile-oriented marketing, sustainability*

1. Introduction and research method

The world is changing fast and entire industries are reinventing themselves in response to complex transitions in economic, social and environmental areas. The increasing urbanization is a key trend and the design of city systems will play an essential role in shaping a sustainable, innovative and livable future. Therefore, cities are subject to constant change and diverse development trends. [16] The demographic change shows a significant, unambiguous direction. Over the coming years cities substantially continue with strong growth. On the other side, it is likely that many peripheral and structurally weak regions are currently standing at a watershed in terms of their regional orientation and in particular are affected by struggle with massive declining population levels and an increasing number of elderly people. [13] However, in this connection, we must also bear in mind that today innovation, diversity and networked thinking, are significant and even more important aspects in a sustainable urban and competitiveness regional development and go hand in hand. Moreover, the basis of an efficient communication strategy, focus in particular on developing long-term, innovative and interlinked thinking.

Cities are also the carriers and pioneers of socio-economic change and are embossed by their urban living space. According to current reports of the United Nations, half of the world's population is living in cities and it is expected that this number increase to two thirds of the world's population by 2050.

There has been an increasing process of merging cities and their surrounding regions into a metropolitan figure and a distinct separation and hierachization of spaces has become difficult. Therefore cities are expanding to regions [22], creating a homogenous entity of space regarding geographic, economic or political criteria.

Therefore, the importance of urban living space is constantly increasing, as cities are the housing-, work-, and life-centers of most people. In this context demands in reference to the usage, planning and design of urban living spaces and cities are increasing [21] thus require an innovative thinking manager, planer, leader and the use of new profiling systems.

Urban living space has long been viewed as the setting of social and economical developments. However, urban living space can be viewed as more than that. Current theorists argue that people are constantly reconstructing space in their daily actions and space however, has in the past few decades been redifined by sociologists. [18] Also the scientific attentiveness towards spatial phenomenon is currently exceedingly high. [21] [18] Therefore, urban space is no longer the setting but becomes an integral part of social and economic processes and is characterized by suburbanization and structural change and requires to understand city planning as a dynamic development process. [14] According to Heinrichs [7], there is a growing mutual competition between cities and regions, much like between companies on a free market.

The paradigm shift in the understanding of urban living space mirrors current paradigm shifts in marketing. Where the brand itself was in the center of marketing strategies until recently, new marketing models focus their efforts on people. Profile oriented marketing [12] has demonstrated successful in distinguishing goods and services from those of competitors, because the profile, incorporating the values of an organization gives the product an emotional fingerprint.

The aim of this work is to link current trends in city development and the understanding of urban public living space to current trends in marketing strategies, i.e. to link the attractiveness of a future-oriented city/region to profile oriented marketing and adaption management. Thereby, the linking concept between both theories is the concept of identity/culture. The focus and ultimately outcome of the doctoral thesis is to design an action-oriented model for strengthening and accelerating sustainable city development in the light of current and future challenges of urbanization. Already existing successful management models are adapted from organizations and are sharpened and enriched in their application to cities. Thus in this thesis – for the first time – will these two important trends in marketing and management be merged for utilization in city development planning.

Therefore, the proposed thesis focuses on the following research question(s):

1. Is profile oriented marketing a suitable tool to increase

(i) the attractivity of a city/region to individuals (citizens) or organizations (companies) and thereby enhance the social and economic development

(ii) the sustainability of said development.

2. Which adaptations to profile oriented marketing could increase (i) and (ii).

This topic is very fresh and important, which is demonstrated by the fact that 2015 the science year is dedicated towards defining future cities.

The cities of tomorrow will differ essentially from today´s city principles.

Thereby it is out of question that in times to come, cities, definitely need clearly structured and consistent development plans in order to provide a secure social and economic environment for their inhabitants to work and live in. Normative goals are replaced by strategic guiding principles for the construction of competitive and sustainable urban structure. Therefore it is the task of public manager, city- and communal manager and those who took on responsibility to make sure that short-, middle- and long-term requirements of the citizens are met as best as possible, so that a high, sustainable, innovative, urban development quality can be achieved. [11] This work is dedicated towards developing such a profiling system for city development planners as an adaption of marketing strategies from organizational theory to define a new "*city of the future*" – paradigm.

The themes and content of adaption management and sustainable urban city development cannot easily be separated from each other, as they are often both overlapping and interrelated. Thus, it appears to be important to address the question from a management perspective of the role of adaption management in profile oriented marketing for sustainable, innovative economic and social development on the one hand and from a marketing perspective on the other hand.

1.1 Knowledge base for the derivation of the new approach

The derivation of the approach lies in the need for city development consulting, which will increase through the growing complexity and integration of the global world, which also will increase the responsibility of the cities to ensure a high quality of living for its citizens. Not all city managers and politicians will methodically be able nor have the time themselves, to master and steer the necessary city development process, with clear content, consequent and durable, in all city divisions. Apart from city development and urbanization, the theoretical foundations of this work are based on the holistic management theory, change and adaptive management and new marketing models, such as profile-oriented marketing, as well as their application to cities in form of urban management and city marketing. Additionally, the model receives input from findings of current case studies and research projects on urban development. The focus lies on the usability of these marketing concepts to increase the sustainability and development quality of urban spaces within city structures. Dynamic profiling models shall increase the visibility and uniqueness of competitive sustainable urban structures and provide solutions to optimize the urban living environment. Current European and international phenomena and technological potential of shaping urban space are discussed.

1.2 Method of the proceeding

The adaptive urban profiling system could be applied by city planners and public managers purposefully and efficiently for these future and practice-oriented tasks and shall help them prioritize and tackle next innovative and future steps. It is to be understood as a planned, innovative, flexible methodology for initiating, directing and controlling urban development processes. Profile oriented individual development concepts can initially be developed with his help, which could then be implemented as a systematic planned development process. This type of method/system also allows the evaluation of various practical development cases, the identification of possible problem areas and its corrections. The reflection on the practical cases, depending on the new method/system used, allows the gaining of knowledge for the continual improvement of the mthod/system itself. It is supposed to design case-specific future-oriented development concepts and integrate them into a systematic realization process. The procedure can be applied to any city in order to recognize and correct its specific problematic. [8]. Thereby, the procedure will continuously improve with each application. [8] In accordance with the integrated St. Galler management theory, the profiling system shall provide a mental roadmap, but not a patent solution. The system "adaptive urban profiling" postulates in its core the Cause-Effect-Connection between the content clarity of a profile oriented, i.e. identity creating and future oriented city development planning and the resulting efficient use of resources, the fundamental change of the participating development actors, as well as, the consequent profile oriented and iterative permanent process of the implemented development planning in reality. The adaptive urban profiling system shall enable city development planners, public managers and communal polititians to identify specific and interdisciplinary sucess factors for managing the transition towards sustainable cities. [2] [17]

1.3 Derivation of the new approach

Prior to the empirical work, a new urban profiling system will be developed based on Kellners model for profile oriented marketing and active adaption management (-> adaptive urban profiling system). The adaptive urban profiling system will be developed using market oriented innovation management. [9] Available knowledge based on the analysis of the current situation is summarized and a multi-layered concept can be developed and afterwards applied and tested. [5] [19] At last a critical reflection of the results of the application will give indications about potential improvements of the adaptive urban profiling system. [1] [3] [4] [6] [20]

2 Theoretical foundation

2.1 Adaptive management

It is important to translate and describe the term and aspects of adaptive management in an easily, clearly and comprehensible way to put it in practice, to ensure that becomes reality and are systematically integrated into daily actions that are oriented towards the specific needs and the new usage and planning. Adaptive management was introduced in the 1970s, by a group of ecologists.

Their definition basically translates into „*learning by doing'.* Adaptive management is now used for all kinds of projects outside the field of ecology. The key to adaptive project management is to manage projects based on learning from actual project performance and to learn via the use of quantitative methods. Therefore, adaptive management includes the following elements [10]:

- The formulation of management objectives, which are regularly visited and revised.
- A model of the system being managed.
- A range of management choices.
- Responsive power structures.
- Monitoring and evaluation of outcomes.
- A mechanism(s) for incorporating learning into future decisions.

The goal of adaptive management is to determine the best management strategy through experimentation. Thereby, adaptive management aims to enhance knowledge and reduce uncertainties from natural variability, incomplete data [15] or social and economic changes. Furthermore, adaptive management aims at a timely response to such changes, i.e. flexibility in decisions.

Adaption management can be distinguished in passive and active approaches [10].

2.2 The role of adaption management in profile oriented marketing for sustainable regional economic and social development

Cities or regions are constantly subject to social and economic change, reshaped by the daily actions of their inhabitants and resident organizations. Therefore uncertainties can be expected to be high and management processes have to be highly flexible. Thus, adaption management measures could be valuable to the aim of increasing the attractiveness of cities, regions and enhance the sustainable social and economic development quality via profile oriented marketing. The paradigm shift in the understanding of urban living space mirrors current paradigm shifts in marketing. Where the brand itself was in the center of marketing strategies until recently, new marketing models focus their efforts on people. Marketing strategies need to be monitored, evaluated and updated accordingly.

2.3 Profile Oriented Marketing

Profile Oriented Marketing adds a new dimension to the concept of marketing: the philosophy. Profile Oriented Marketing is strategic marketing with a profile.

A profile is a bundle of individual, as unique as possible characteristics of a communality. These characteristics include the quality statement (*mission*), the aspired state (*vision*), a clear and valid mind-set (*principles*) and the appearance (*corporate identity*) of the organization.

By defining its aspired state, the profile gives an organization a clear direction of development, a perspective to work future oriented. Therefore, the profile is the pivotal point of marketing actions, as outlined in the Profiling-Structure Modell by Kellner. [12]

The profile is in itself a result of constant analysis and prognosis of the own organization (city), the environment, the competitors and a prognosis of future market development. Once the profile is established clear goals can be defined and strategies and measures to achieve these goals can be developed, which can then be realized by a strict organization and control mechanisms at each implementation step. Thereby, profile-oriented marketing sets an example of how the management processes formulated by the St. Galler management model should be implemented in marketing The profile is provided by the normative management, the strategic management is responsible for the conception of the marketing strategy and the operative management for its realization. In that respect, profile-oriented marketing implements measures of adaption management. It is however a challenge to bridge the gap between providing a clear perspective and keeping values constant and recognizable, as intended by the profile, on the one hand, and constantly updating and flexibly changing marketing strategies on the other hand.

2.4 The role of marketing for city development and the parallels between trends in this two fields

Globalization is the major challenge for both, marketing as well for city development. Both companies and cities do now exist in an international environment requiring global thinking and increasing interconnectedness to other cities and companies. This process of globalization results in increasing competition for both cities and companies. Therefore, both companies and cities have to increase their adaptive capacity in order to survive.

Another common denominator among the current challenges for marketing and cities is change. The environment of cities and organizations is constantly changing at an increasingly faster rate, such that both cities and organizations are challenged in their adaptive capacity. Historically both organization management and cities development was reactive. When social or economic changes occurred, the spatial organization of cities or the

management strategies of organizations were changed accordingly. For both companies and cities, counter-movements emerged to change from a simple reactivity to proactive planning. These movements came in the form of strategic marketing for companies and (new) urbanism for cities. However, for both companies and cities it is now necessary to move from a proactive planning to an interactive management process.

3 Research Methods - Potential empirical and statistical design

The object of investigation in this thesis will be cities. In order to fully capture the breath of the research question, it will be necessary to collect data from city manager, city planners, the cities citizens and the local companies. 200 cities in Austria will be randomly selected and asked for their participation.

The study design will therefore be a multi-level design and combine qualitative and quantitative data sources.

The independent variable in Research Question 1 is profile oriented marketing or the elements thereof. The independent variable in Research Question 2 are possible adaptations of profile oriented marketing by elements of adaption management.

The dependent variables are the urban development on the one hand and the sustainability of the same on the other hand. Thereby both the social and the economic development will be taken into account.

Assessment methods: These independent variables shall be assessed from city managers, municipals and planners via expert interviews (qualitative) on the one hand and via a standardized questionnaire on the other hand.

For the assessment of the dependent variable a multi-method approach will be taken into account in two steps. On the one hand, and as first step, the status quo of the urban systems shall be identified. To achieve this status and derive a city profile, the attractiveness of the city to citizens (quality of living) and companies will be assessed referring to a mixture of adaptations of the Mercer study on Quality of Living.

On the other hand, and in the second step, the sustainability performance of the city shall be evaluated. Measuring sustainability represents a long-standing issue in urban studies. Also population and economic growth indices will be taken into account. The two data-sources (citizens and companies) are interlinked, since employment options as well as income of the citizens will depend on the local companies.

Statistical analysis will be carried out via structural equation modelling. Structural equation modelling is particularly suitable to assess complex interdependencies between multiple variables. After the model has been defined, covariance matrices are estimated and fit indices to assess the fit of the model to the data are computed. These fit indices can also be used to compare multiple models for their suitability.

For this thesis the fit indices of the structural equation models using classical profile oriented marketing as independent latent variable and an adapted model of profile oriented marketing (to be developed in the theoretical phase of the thesis) as independent latent variable will be compared. The dependent latent variables are development on the one hand and sustainability on the other hand, which are both split into a social and an economic factor. The observed variables are the interview and questionnaire data. The models are depicted in Figure 1 and Figure 2.

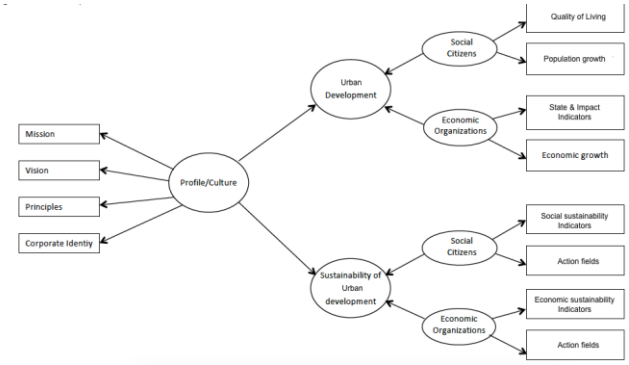

Figure 1 Structural Equation Model 1 – Profile Oriented Marketing, own representation by author

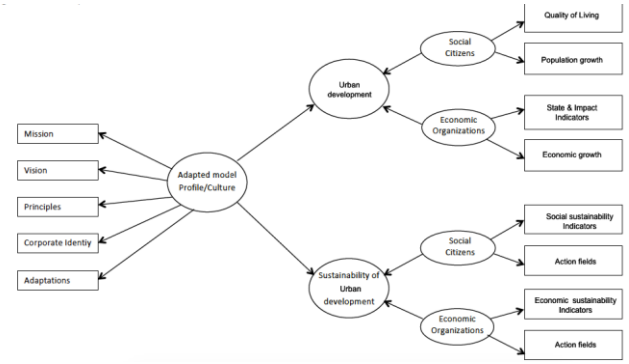

Figure 2 Structural Equation Model 2 – Adaptive Urban Profiling System, own representation by author

Expected outcomes

It is expected that the more and the more consciously and clearly city planners orient their strategies towards profile oriented marketing, the more is the profile visible to its citizens and local companies, which leads to identification with the city and higher proactivity to achieve the common goal of increasing the cities attractiveness. Therefore, higher quality of life and attractiveness ratings, as well as higher expected sustainability of these ratings are expected in cities with a clear profile/culture. However, it is also expected that an adaptation of profile oriented marketing is more suitable for city planning and more successful for city development and sustainability. Possible adaptations include a stronger focus on the people and higher flexibility and the possibility of constant modifications and updating to the profile.

4. Conclusion

In summary adaption management is a valuable tool to be integrated in marketing approaches for sustainable regional and economic development. Profile oriented marketing

appears to be the option of choice too increase attractiveness of cities or regions and can give important impulses. It may be helpful to assess the adaptive capacity of a city or a region in case of social or economic change. This capacity may even be integrated into the profile as part of the marketing strategy: *We are attractive, because we are adaptive*.

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IMPORTANCE OF THE FACILITY MANAGEMENT (ACTIVITIES) FOR THE COMPANY SUSTAINABILITY

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Abstract: *Nowadays, the need for sustainable business has the highest importance. Organizations worldwide understand that and this need reflects in their policies and decisions. As facility management is also a driver in the nowadays business, the companies from this field develop practices according to the global developing strategies and are careful to the social, environmental and economic aspects.*

Keywords: *sustainability, facility management, responsibility, progress*

1. Introduction

The modern perspective on the evolution of mankind in relation with the environment, social environment and economic environment has developed new tendencies and created connections between concepts.

According to the definition from the Explanatory Dictionary of Romanian Language, sustainability is the quality of an anthropic activity (determined by human action) that takes place without using up the available resources and without destroying the environment, and without compromising the ability of future generations to meet their own needs.

The world conference on environment held in Rio de Janeiro in 1992 paid special attention to the concept, implying the balance between the economic growth and the protection of environment and finding alternative resources. When speaking about the economic growth of a country or region as a whole, the synonymous term sustainable development is preferred.

The concept of "sustainability" considered as a solution for the ecological crisis, as a reconciliation between economy and environment entered more and more into the everyday speech, thus acquiring a major significance in the business language, where it became a priority of the business environment.

In the same way, the concept of facility management was taken over in the specialty economic language around the 70's; the concept is more and more present in the business language, the specialists in the field considering that there are real opportunities for the facility management to integrate in the near future the support services of an organization as a whole.

People talk more and more about sustainability or sustainable development at micro- and macroeconomic level, about minimising the costs, about looking into the future taking into account the social, economic and environmental effects of the actions performed. Facility management through its essential services offer sets the same objectives and aims as the sustainable development.

The stake is to identify as soon as possible the wishes and needs of the parties the company interacts with, to adapt to new reality, to be innovative and open to progress. By taking into account all these aspects, the evolution of the companies is steady.

2. Sustainability – general presentation

Sustainability is a well rooted concept introduced in the current vocabulary. The definition most commonly accepted and used is the one given by The World Commission on Environment and Development (1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. As such we understand that society, mainly the companies, must be responsible to the whole mankind and to the future generations.

The development of the concept is based in the field of the environment. In time, the concept has acquired three dimensions. According to the "Triple bottom line", a sustainable development can be achieved only when the following three aspects are taken into consideration equally: economic, ecologic and social [2].

Figure 1: The triple bottom line

The practices of the facility management have the ability to provide sustainability by their ability to impact upon the economic environment and to attain the targets, by activities of campus planning and design, building construction, waste management, environmental

management, and building and grounds maintenance and cleaning.

3. Current and future trends on European level

The European Union's priority is favouring a sustainable and competitive community. Its strategy 2020 aims at providing an intelligent economic growth (by innovations in education), improving the environment (by reducing the carbon dioxide emissions) and at social inclusion. In order to develop the three axes, five major objectives are proposed [3]:

- Attaining the employment rate of 75% for the active population (20-64 years);
- Allocating 3% of GDP for research and development;
- 20% climate change: increasing energy efficiency, increasing the weight of the renewable energy sources, reduction of the gas emissions as compared to the year 1990;
- Enhancing the education level;
- Fighting against social exclusion.
- As for the situation of Romania, the following targets have been set, under the coordination of the Department for European Affairs of the Romanian Government [4]:
- Reducing the consumption of the primary energy;
- Increasing the weight of the energy derived from renewable sources on the whole by 24%;
- Reducing by 20% the greenhouse gas emissions;
- Allocating 3% of GDP for research and development – a difficult objective to achieve due to the current structures in the field;
- Increasing by 40% the share of the population under 30 years having completed tertiary education – aim that is achievable only by reforms in education and economy;
- Increasing the social inclusion by an increase of the funds for social work and by reforms in the health field;
- Reducing the early school leaving – by implementing social programmes;
- Increase of the employment rate to 75% by reforming the legal frameworks for the stimulus of employment and continuous training.

In the following table are highlighted the results of a comparative study of objectives, regarding the strategy of Romania and Austria as member states of EU [5]:

Table 1 Objectives for Europe 2020 Strategy

EU/member states objectives	*Employment rate (%)*	*C&D (% of GDP)*	*Reductions of CO_2 emissions*	*Renewable sources of energy*
AT	77-78 %	4%	-16%	34%
RO	70%	2%	19%	24%
EU/member states objectives	*Reduction of energy consumption (Mtoe)*	*Early school leaving (%)*	*Tertiary education (%)*	*Reduction poverty/social exclusion (number of person)*
AT	7,16	10%	38%	235.000
RO	10,00	11%	27%	580.000

All these desired directions are different for the two countries because of the development stage of each one. Although, in both cases, these directions are transposed into carefully organized activities at microeconomic levels, and together with a supporting legal framework they shall achieve the proposed objectives and develop a healthy and long-lasting society.

4. Activities of Sustainability within companies

Supplementing the strategy of sustainability of EU, the European Commission adopted in 2014 the Directive 2014/95/ EU as an amendment to the Directive 2013/34/EU referring to the requirement for the companies of more than 500 employees to report non-financial information [6].

During the years 2015-2016 the member states shall transpose the directive into the national legislation, and until December 2016, the European Commission shall prepare the guidelines on the methodology for reporting non-financial information.

The aim is to prevent abuses and encourage the sustainable and development activities at a micro- and macroeconomic level, as well as for a spirit of transparency that shall improve the business behaviour.

The KPMG study about the Corporate Social Responsibility (CSR) reporting shows that in Europe, the reporting percent shall increase significantly until 2017 due to the European regulations and it draws the attention upon the fact that, for the time being, there are significant differences within Europe (see Figure 2) which ranked Europe third on an international level (see Figure 3) [7]. After complying with the legislative rules, these differences will disappear, and Europe will experience a revival in terms of the attention offered to reporting and to the related business activities.

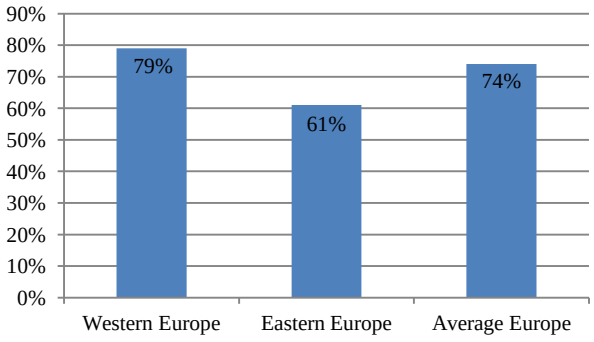

Figure 2: Reporting rates across Europe

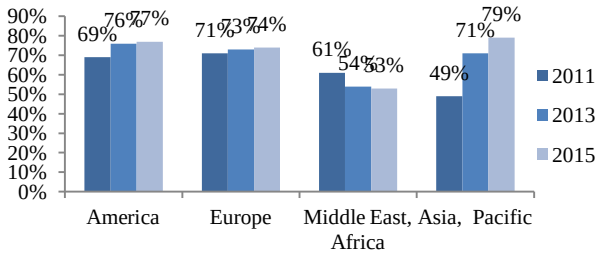

Figure 3: Global trends in CSR Reporting

5. Importance of facility management in the sustainable development of the company

CSR reporting is an instrument of reporting the annual performances, supplementing the financial statements. It covers the reference fields for sustainability (environment, social, economic) by waste management, emissions, environmental performance, social performance, community engagement.

Facility management represents a field taken over into the economic language in the '70's and it is defined as "integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities". [8] It includes a wide range of activities that agree with concepts like efficient costs, improvement of productivity, innovation, efficient technologies, and high quality of life.

Facility management plays a significant part in supporting the sustainable performances, beginning with the purchases, management of the buildings, management of the employees (healthy and safely), waste management (recycling, reduction of energy consumption), and until the facilities performance, aspects that impact directly upon the social and environmental indicators.

As a part of the sustainable development initiative, the suppliers of facility management services may offer to their customers the implementation of some future oriented technologies and practices. The aim is not only economic but to change the global mentality towards a large responsible opening to the social and environmental needs.

This long term responsibility orientation should take into account the impact the activities of an organization have at a community level. Thus, adopting a CSR strategy in the FM activities, it will result a strategy based on moral values, development, improvement of the situation in the entire internal and external environment of the organization, transparency, risks reduction and last but not least, it will bring improved financial results by the efficient use of the resources, improving the image and the quality of the relations with the stakeholders.

Analysing the Triple Bottom Line Approach, it can easily be noticed in practice that the following aspects are accomplished [9], as presented in figure 5:

At an economic level:

- The efficient planning of the budget by taking into account the global impact of an activity;
- Cost savings by the efficient use of the resources and of space;
- Effectiveness of decisions for the entire supply chain by having some common sustainable perspectives;

At a social level:

- At the internal level of an organization: respect for the human rights and improvement of the work environment, hence productivity increase;
- At the external level of the organization: community development and care for the future generations by protecting and improving the present situation;

At an environmental level:

- The indoor and outdoor air quality by using the green devices (ventilation, sanitary, gas etc.) and the environment-friendly building materials;
- Development of economic buildings with low energy and water consumption;
- Application of waste minimisation techniques.

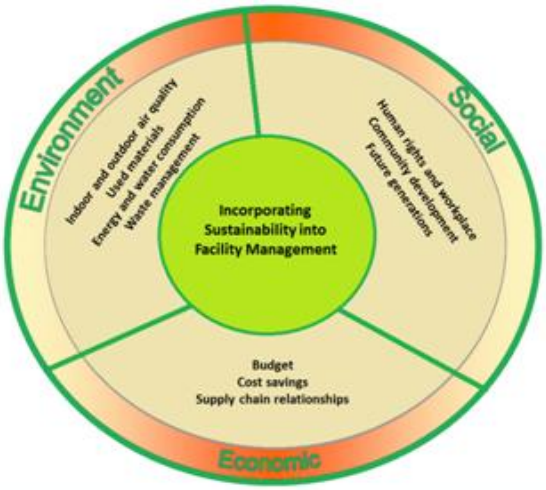

Figure 4: Incorporating sustainability into facility management

6. Impact of the facility management upon the sustainable policy of the company – case study OMV Group

The international oil and gas company, OMV Group, has been reporting on sustainability since 2001, in order to describe their attitude to the environmental, social and governance issues. The sustainable strategy called „Resourcefulness" wants to create a long-term win-win situation between this three dimensions and the company.

During the year 2014, OMV Group had an active environmental and energy management, invested EUR 108 mn in environmental protection and carried out 1,250 actions in their top 43 facilities. They supported local economies through local employment and by developing local suppliers and also educational initiatives, with a particular focus on technical education for women and entrepreneurship [10].

The department of facility management from Romania is responsible for a wide range of activities such as: Business Suport (Canteen and catering services, stationery management and travel services), Facility Servies (standard working places or office relocation, maintenance services -

electricity, elevator, furniture, cleaning, temperature, outdoor services), fleet management, Real Estate asset Project Management (to increase transparency of the OMV Petrom's real estate asset portfolio in Romania (location, building, legal status, financials), and to provide recommendations for portfolio size optimization, modernization and consolidation) [11].

All these activities are centered in such a manner as to attain the objectives of the sustainable policy of OMV group.

One of the fields of interest, pertaining to the facility management, which have been remarked and contributed to the sustainable development of the group in 2014 is „Health, Safety and Security": activities focused on the employees' physical and mental well-being, accident prevention, and international cooperation on security. The desire/objective is to implement in the future the HSSE standards in order to prevent the possible human injuries [10]. Under the global conditions, the risks of disease outbreaks by biological vectors increase, and ensuring a high level hygiene and safety against pathogens in the environment we work or live, represent an essential element for the people's health.

The company integrated within the group a Health Management Department promoting the awareness of health at the workplace. In the meantime, there is a network of physicians, nurses and medical experts who work in Romania, offering medical and advisory services (PetroMed). Medical analyses and vaccination programmes are organized.

Hygiene is another aspect of high concern. The disinfection and pest control activities are performed both inside and outside the company, as often the health rules in force provide.

Due to the specific field of industry the company activates in, the prevention of accidents is essential and guided by strict rules. We train, empower and encourage people to work safely at all times and invest in technology, programs and processes to ensure that our facilities and operations are safe for employees, external stakeholders and the environment.

The management of the vehicle fleet takes into account the safety of the employees, by service activities and by ensuring safety travel conditions through special trainings.

Another component, as part of the employees' ensuring a high level of wellbeing and comfort is the management performed by the Department of Facility Management of the reception, catering and canteen services by a careful selection of healthy products able to cover the diversity of the employees' tastes.

By the management of the spaces and areas, the facility management team offers modern workplaces, ergonomic lights according to standards. Projects of planning, design and relocation take place continuously in order to create an attractive work environment, always new and healthy for the employees.

Environmental Management – this field of interest, for the OMV Group, is closely linked to the basic activity of the company, but also to the way facility management deals with the wells, refineries and corporate offices, which are preserved and maintained at high levels of energy and environment efficiency by the facility management. The waste management, the management of energy, water consumption and carbon emissions are the lines of interest in this respect.

In Romania, the company finished in the year 2011 the campus called Petrom City that is endowed with a tri-generation plant (producing electrical power, heat and cooling energy) unique in the country, and in the year 2014 the company finished Petrobrazi refinery modernization, thus improving the economic efficiency by 25% to the year 2009.

The Facility Management Department offers recommendations for optimising, modernising and strengthening the real estate portfolio. It performs technical assessments, identifies solutions and starts projects up to the delivery stage of the investment to the recipient, respectively the company.

The facility management department coordinates all these activities, performs internally facility management initiatives and in the meantime it works with subcontractors, specialized companies in the field, adding more value to the activity and supporting the sustainable development.

7. Conclusions

Sustainability is an important subject on the agenda of the superior levels of management. Companies develop policies in accordance with these international trends and develop society and environment-friendly practices, but in the meantime in compliance with the economic conditions. Reporting these practices is part of the strategy, and the trend is upward. Being new and in a process of development, the field of facility management is directly interested by the compliance with these requirements. All the activities related to this field are developed in order to contribute to the wellbeing of the society at large.

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GEOGRAPHIC INFORMATION SYSTEM (GIS) CONTEMPORARY SYSTEM CRUCIAL FOR LAW ENFORCEMENT AGENCIES

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Abstract: *Geographical Information System- GIS is called from many professionals as a next step in the evolution of information technology. GIS system is the basis of information and analytical equipment that aides in managing large number of data not only from one source but enabling gathering of data from many sources at once. Nonetheless, GIS at the same time accelerates the responding time and better understandings of data importance especially to law enforcement officers whose time for crime prevention and rapid solution of problems is a prime. Using GIS is worth for every penny invested in it. Everyone from its users has benefited from the introduction and continuous development of GIS, but it has been considered as the most powerful technological change from the law enforcement agencies. Application of the system from law enforcement agencies made a huge progress on its performance and service providing on Administration, Management, Patrol operations, Analyses of crime, Information and Reporting. This paper will explain why GIS is considered as such from these agencies, how it is used by them and also the implementation of GIS into these institutions. Additionally, GIS has increased the effectiveness within law enforcement agencies enabling them progressing much more, being precise, accurate and efficient on a scope of the work especially on crime analysis and public safety.*

Keywords: *GIS, Law enforcement, data, analyses, safety.*

1. Introduction

Geographic Information System (GIS) is the new emerging field and grows at very rapid pace. Currently, GIS is being used by many professionals in miscellaneous disciplines. Due to its importance the system has become a billion dollar industry with applications in various fields and disciplines As any of technology is developed out of necessity, GIS has no exception. In fast moving livings trends, nowadays it is unimaginable and impossible either manually collecting, storing and retrieving bundle of documents with data in it. Therefore, when large amount of data available are needed to be processed, technology takes place by giving hand to its users via using a computer and other similar tools in order data to be gathered, stored, organized, and retrieved for later current or later utilization. This is exactly what GIS is about. So, merely GIS is a system which in general integrates, stores, edits, analyses, shares, and retrieves various and diverse type of data by displaying them as information for later usage (Elengovan, 2006). Geographic information system plays an important role not only on spatial history. From its the very beginning of this technology development, the application of GIS contributed mainly to the spatial data which helped the way people work; distribute their knowledge and also how people live. Along with GIS, the technological advancements had a great impact on GIS developments through years by becoming much more powerful and user-friendly (Silveira, 2014). Since GIS technology is growing faster and becoming much more powerful, it has been seen as a great tool for managing and analyzing spatial data and information for public security. Simply, we are all walking with GIS. This means that, in today's world we are able to find a map, look at it and question about it, plan trips, find camping locations etc. So, in essence, we are able to learn new things from computerized maps provided by GIS technology (Cox, 1995). With abundance of characteristics GIS has been employed by many different organizations and agencies as: governmental agencies, private businesses, national organizations, scholars, and pointing out law enforcement agencies, in particular.

2. Applications of GIS

Applying the law means the solution. As commanding, officer is engaged to answer a scene or an analyst collect pieces of the elements to unite as examples of the incident to make decisions, as part of the daily work. Such important decisions have a direct impact on citizens and colleagues of law enforcement personnel. To successfully carry out the work with GIS - geographic information technology offers geographical advantages for law enforcement at the same time by transforming data into actionable knowledge.

GIS combines layers of data on locations enabling users, police officers, who have deeper knowledge of the location where he/she operates also have information on what is happening in the surroundings. Data and information may be collected depending on the intended use either reconstruction or construction area, for better allocation of resources, analysis for discovery of crimes in emergency cases, best examination of the locations to conduct research on crimes last / series of crimes, or for creating perimeter of crime scenes or natural disasters. GIS technology combines dynamically many layers of data on display enabling the necessary data and information to reach the hands of those who need them and who will use them for the common good for all citizens (ESRI, 2008).

Figure 1. Multiple layer map used from law enforcement agencies on crime analyses

Law enforcement agencies face a multitude of tasks and multiple challenges in the performance of their duty which is based on the protection of life and property keep the peace in communities. Virtually every task and challenge has geographical components. Such tasks require strategic and tactical planning especially in rapidly changing societies socio-economic and political. While the law obliges enforcement agencies to collect a large amount of data, only a small portion of data of this information can be absorbed by the data sheets (spreadsheet) and database. GIS provides visual and spatial data by enabling law enforcement agencies to integrate and withdraw data in order to be more informed before making important decisions (Ghose, 2001).

GIS provides law enforcement agencies and juridical staff to create effective plans for answer and emergency interventions, defines priorities for intervention cases and other operations, analyze the history of events and predict future events. GIS is also used for offering information for emergency cases and in cases when patrolling vehicles are on the streets and on the way to the incident location in order to assist field forces.

GIs is the next step in the evolution of information technology. GIS system is the basis information and analytical equipment which helps in managing not only geographical data but also gathered data. By seeing and valuing advantages of GIS in operation, the system has been found and is being used in all areas of law enforcement by leading and managing the daily operations in terms of planning, analyzing, and decision making processes.

Law enforcement, in modern times uses advantages of smart maps – visualization of information and analysis of location - to empower front-line police officers and commanders to make best decisions during their operations. GIS system as a whole makes the integration of any type of data, and applies analytical equipment to solve problems, predict crimes and provides safety for citizens (Liepnik, 2003).

Public safety agencies must accomplish many tasks such as collecting of data, intelligence analysis, assessments of risk and plans, also activities that are related to responds/interventions in providing peace and public order. In emergency cases, staff presents in visual form the accident that happened and analyses the conditions to respond, support and heal the person/persons that were involved in the accident. GIS technology firstly supports the staff in cases of accidents by providing tools to cover the case with efficiency and helping them so they can take the right decision regarding the emergency case (Lutz, 2003).

Geographical information system has found a great usage in public security agencies. Using and implementing this system has offered easiness and assists by making progress in the operations of officers for public safety services. The system has a comprehensive implementation in the usage of: Administration, Patrol Operations, Crime Analysis, Special Operations, and Corrections (Ferreira, 2012).

Administration: Using GIS in administration creates easiness in staff duties inside the safety departments. Administration staff must take decisions based on accurate and reliable data. Therefore using geographical information system enables improving of plans, by reducing operating costs and raising transparency. The platform offered by Esri- the manufacturer of electronic visual maps software (index5) - enables the department to apply the force of virtual geography of GIS system to organize, visualize, share important data in function of the organization. Through smart maps the administration staff uses them for analysis and decision making with the goal of achieving the objectives during the strategic planning. Benefits that GIS offers are:

Planning – uses to cooperate towards achieving the organization objectives and implementing of the reports through CompStat, recruitment of new officers and many other functions that helps the administrators in their performance.

Management – monitors the devices and detects based on the maps, also observes anything usual.

Commitment – enables to understand better the problems of the community. Shares the information with the public through open maps over crime and through citizen reporting applications.

Patrolling Operations – From the command center to the field officers, GIS enables that the whole organization will improve planning, operational awareness and mobilization on the ground. Using the geographical information system raises the speed of responding, coordinates activities of law enforcement also on a better understanding of the jurisdiction/authority that the law enforcements have. Analytical maps as a foundation stone in operations of law enforcement affect positively in the flow of work and provide an understanding of the conditions in which the crime has happened, by improving the responds which directly affect on the tasks of the field officers which provide public security (ESRI, 2012).

Benefits that can be earned from using the geographical information system on special operations are:

Sharing: transferring the scarce resources by using the maps to observe anything on a place such as: staff, incidents, assets, traffic and other useful things for field officers that have patrol duties.
Improving by using CompStat you improve the plans, whether they are short-term plans or long-term plans or daily operating tactics using maps as usual operational views.
Protecting-provides: protects and serves the officers and the community using intuition maps and offers a better meaning in local level (Johnston, 2001).
Analysis of crime: All agencies pull out data from the CAD (Computer-Aided dispatch) or RMS (Record Management System) system and from all other systems or police sensors, the staff of law enforcement may have difficulties to summarize all the needed data in one place. With ArcGIS platform, the crime analysis department can generate large amounts of data from one single place from the examples of crime and the appropriate police strategies become evident.
Benefits of using GIS in crime analysis are:
Prediction: Location analysis makes the connection and identifies the samples/models. Convert the historical data and actual trends in knowledge.
Optimizes: Makes the connections inside the organization/police service – telephone calls for services, locations of crimes/incidents, data and information about the suspects. It uses the maps to provide the content of the data.
Shares/uses together: operational data taken from the panel of the devices which is located on the front part of the police car on which is put a front camera and mobile devices with the potential of analyzing fingerprints- all of the from the center of command in real-time to the patrol car.
Special Operations: Special management of events and operations is a part of the law enforcement mission which part is growing day to day even more. Whether there events are planned or not, preparing for them is important. Esri through GIS helps you to plan even the worst case events through the space solution which supports initial planning, tactical operations and final debriefing. Gathering spaces, location of officers, assets and the needed cars are used to fulfill the mission (Groff, 2002).
Positive effects of using GIS in special operations are because it helps to:
Prepare: that in case of operations, the officers must be prepared with maps which support the initial planning for the special events, interventions in case of natural disaster also other tactical operations on a larger scale.
Manage: Raise awareness in real time in situations that can only happen during the operations and at the same time it adds possibilities for interventions in incidents at the time that they happen.
Inform: Organize, analyze and shares for usage the timelines (deadlines) of events and all of these in understandable forms. It collects the data and locations all together in a narrative form-in speaking (Chainey, 2013).
Corrections: mission of those responsible/officers of law enforcement is more than detention and arrest of persons with criminal record. All types of crime management benefit from analysis over locations and visualizations. Regardless if the departments deal with arrests, detainment, fines or monitoring of those released on bail, the correction officers must use integrated maps that also can be used from other units by sharing them, these maps are used to improve corrections, releases on bail and the duties of persons released on bail. Improving in decision making is supported by data that are offered from using GIS system which enables to observe and monitor the situation and also react if it is requested.
The same as using in administration, patrol operations, crime analysis and special operation even at corrections the application of GIS brings its benefits which separate as following:
Tracking: helps in managing the activities of prisoners, identification of dangerous prisoners and places with possible violence using the comprehensive maps.
Monitoring: it offers opportunities for observations of many locations in one place while enabling that the observe officers to have the chance in real time to have it clear what is happening in field or spaces where the arrested or the prisoners are held.
Reporting: collects the observation reports, manages uploaded works, develops automatic alarms and offers more accurate information in communication with the interested parties.
For the advantages that GIS offers in corrective issues, Alphonzo Albright, director of Correctional Center in New York, USA, says that: Plans and responsibilities grow with the application of GIS in the correctional departments, inmates and released on bail (ESRI).

3. GIS in police intelligence services

New developing trends between agencies of future thinking, through the force of GIS it is enabled to them the transformation of police officers to protect and serve the community. GIS at the same time offers methods based on information and supports all roles and aspects of law enforcement. The use of GIS was proved to be very effective in many departments and police units while offering help for the staff:
Staff in field – can have access in the intelligence information from their mobile devices while identifying suspicious activities, enabling them to expand the field of investigation, to have access on data about the suspect/suspects and accomplish crime analysis.
Incident commanders – can use GIS to understand the trends, to make important decisions in cases when crimes happen and they can cooperate with other agencies that have also the responsibility of law enforcement.
Crime and intelligence analysts – use sophisticated /advanced devices to support decisions during the operations and address issues of tactical strategies whether they are short-term or long-term.
Police chiefs - GIS can offer the chief of police comprehensive view in long-term decision making. Also, they-police chiefs can look and analyze predictive models of crime with the purpose of developing detailed and comprehensive strategic plans in support of the staff.

Also the enforcers can use GIS as a solution for:

- Defining optimal locations for resource sharing,
- Analyzing the dynamics of incidents to take decisions based on accurate information and for supporting operations,
- Identifying and examining suspicious activities and threats,
- Improve the safety of the officials and officers by offering them information and attention from incidents that can be repeated,
- Create a crime scene in a visual form in order to provide integrity for investigation,
- Exchange information with the neighboring authorities or other authorities in many countries of the world (Ratcliffe, 2012).

4.Conclusion

At this time of rapid technological changes, the interaction of technology and GIS is more than necessary. Additionally, there are a lot of benefits, as above mentioned, from this cooperation between technology and GIS. Called as a computational geography, GIS is simply an interaction of environment and humans in space and time (Frank, 2000). Last two decades, GIS has revolutionized the world. Given that GIS technology has evolved and grew very quickly with other integrated technologies, it has affected the planners by making important changes in geospatial technology. Nowadays, GIs is a tool kit for planners as a standard item. This means that GIS is having a great impact in the way we live and the way we work (Drummond, 2008).

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SPECIAL ECONOMIC ZONES IN POLAND AND IN THE WORLD

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Abstract: *The study is an analysis of the quantitative and territorial functioning of special economic zones in Poland and in the world. It provides definitions and origins relating to economic zones as well as examples of the existence of special economic zones in highly developed countries and developing countries. It also highlighted other reasons for the creation of economic zones in countries with a high degree of development and in rapidly developing countries.*

Keywords: *special economic zone, enterprise, investments*

1. Introduction

The special economic zone is currently the most common form of economically privileged zones in the world, that is, where the government of the country concerned has applied extraordinary facilitations, reliefs, and tax reductions. Legal environment considers it as a special place - enclave on the territory of a state where the rules governing the overall national economic activity do not apply. The aim of the study is to show the real state of the quantitative and territorial existence of economic zones in selected countries, distinguishing between developed countries and developing countries. The study was based on the literature and statistical data of the Central Statistical Office in Poland.

1.1 Economic zones - essence, definitions, objectives

According to the economic approach, special economic zone is an element of the global economy, whose aim is to create special economic and financial incentives and to build mechanisms of connections in the international market. The concept of "special economic zone" is not accurate, even at the level of a single country. In each country there is an even greater diversity of the term. The definition of this term is the sum of many meanings, consisting primarily of its individual parts:

- "Special", because of specific regulations applied exclusively to the areas covered by the zone,
- "Zone", as it represents an enclave within the territory of the country,
- "Economic" because the companies located on its territory may benefit from the economic privileges for their own activities [1].

"The term zone, although it implies a clearly defined territory, is variously applied in practice. In some countries the zones include clearly segregated enclaves (e.g. Dominican Republic), in the others a "zone" is the whole country (Mauritius, Sri Lanka) or provinces or cities (China). In Poland, the "zone" usually consists of a number of enclaves which are located dozens of (...) kilometres away from one another"[2]. Economic zones in the world have different legal status: "(...) from the full economic autonomy to areas under direct state administration. In some countries a uniform law relating to special economic zones is in force in the entire country, while in the other regulations are created for each zone separately (e.g. China, Malaysia) "[3].”The privilege of zones - areas that are identified spatially - involves mainly releasing the operations conducted within them from fees and regulations that are in force outside their territories" [4]. In Poland, the legislature decided to describe economic zones as closed territorial enclaves. It is in Poland a relatively new concept. According to the Act of 20 October 1994 years Special Economic Zone is an administratively ring fenced, uninhabited area of Polish territory, where business activity may be conducted based on preferential terms [5]. Economic zones have no legal personality, are a separate part of Polish territory. They are not subject to court registration [6, 7]. They are created by the Council of Ministers by means of decrees at the request of the Minister of Economy, after the completion of all the necessary arrangements with the local authorities [8]. The functioning of the zones is regulated by the specific decrees, which define, among other things: the zone's terms of use, rules of the tender or development plans for the zone [8].

Goals that are set before economic zones show that on the one hand they are to be an important instrument for the development of regional policy, on the other , however, - tools of economic policy in the sphere of specific industries [8]. The essence of the development of the zones is mainly the introduction of new strategic investors, often foreign, attracted by the good investment conditions. Special zones are to use in their own development goals the capital and technology of new investors.

In Poland, only a commercial company can manage the Special Economic Zone (SEZ), provided that the Treasury or the provincial government has an absolute majority of votes at the general meeting. The supervisory board of the management company consists of up to five people. They are the representatives of the Office of Competition and Consumer Protection, the Ministry of Economy and the province governor [8]. The activities in the SEZ are conducted on preferential terms, which gives entrepreneurs tangible benefits. One of them is exempt from corporate income tax or personal income tax, only from the income earned in the zone and on the basis of the authorization

granted [9]. Another benefit for the enterprises is the zone fund, regulated in Poland by the decree of the Council of Ministers on granting aid to new investments under the zone fund, announced 10th April 2006 [8]. SEZs cannot be accessed by businesses related to the production of tobacco products, fuels, spirits and activities associated with the numerical games and games of chance [8].
The creation of SEZ aims to stimulate economic growth and development in the region. The essence of the existence of the SEZ is the realization of goals:

- revival of certain economic activities,
- an increase in exports of goods,
- utilization of unused natural resources, taking into account ecological principles,
- creating new jobs,
- the use of modern technology in the economy,
- an increase in competitiveness of the region,
- utilization of existing infrastructure and industrial assets [10].

1.2 The origins of economic zones in Poland and in the world

Special economic zones have a long history. Their sources are all areas where any relief or privilege for commercial or production activity was applied. The first known privileged zone was the Greek island of Delos in the Aegean Sea [11]. In the year 146 BC in the history of the island of Delos, the destruction of Corinth and Carthage was the beginning of the development of the most important ancient commercial and port cities. The idea of creating privileged zones is more than two thousand years old, because some port cities of ancient Greece and Rome did not charge customs duties. In the sixteenth-century Italy there were economically privileged areas. In an Italian port special areas were designated where goods could be stored and repackaged without paying customs duties. This was to encourage the ship-owners to direct their ships into these and not other ports [11]. The first privileges offered to entrepreneurs were relieves in customs duties, which also contributed to the development of Hamburg (the most important of ports in Europe). Hamburg, Lübeck, Rostock and Riga belonged to the most important cities of the Hanseatic League, which in the XII-XVI monopolized the trade in the Baltic Sea. In the ports of the Hanseatic League there were designated areas where the goods could be stored and repackaged, and then exported without paying customs duty. [12] In Puerto Rico in 1951 the first duty-free zone of the production nature was created; and an export processing zone in Shannon in Ireland, founded in 1959, is an economic zone much better known in the world. Such zones were created also in the Far East (the turn of the seventies and eighties of the last century) and focused primarily on the production and export of goods [10, p. 43]. The existence of zones in a number of countries was affected by economic conditions of those countries, availability of labour, the strengths and weaknesses of the regions and the availability of natural resources [10, p. 100]. Table 1 presents the state and development of SEZ in the world by 2006.

Table 1 Basic values associated with Special Economic Zones in selected years

Specification	*Year*					
	1975	*1986*	*1995*	*1997*	*2002*	*2006*
The number of countries where special economic zones exist	25	47	73	93	116	130
The number of special economic zones	79	176	500	845	3000	3500
Employment in mln	0,8	1,9	No data	4,5	13	26

Source: R. Patusiak, *"Specjalne Strefy Ekonomiczne jako stymulator rozwoju gospodarczego"*, ed. University of Lodz, Lodz 2011, p. 106.

The table shows the dynamic development of SEZ in recent years. In 1997-2006, the number of Special Economic Zones in the world increased by 2,655 and the number of people employed in them by 21.5 million. In 2006, the existence of these zones was noted in 130 countries. Currently, the growth rate is much lower, and economic zones in some countries have a definite short life. In Poland it is assumed that they will exist until 2026.
In Central and Eastern Europe, as well as in Poland, SSE became an instrument of economic change. After the change of regime, governments in 1989 sought to transform the economy from a centrally planned to a market economy [8, p. 86]. The help of the state was necessary to solve many economic problems. On 20 October 1994, pursuant to the Act, Special Economic Zones came into existence in Poland [10, p. 34. They were to attract outside strategic investors and stimulate the economy of the state. In Poland, there is no single economic zone. As the first in 1995, Special Economic Zone Euro-Park Mielec was established for a period of twenty years. In 1997 as many as 14 economic zones were created, and their total area amounted to more than 6,000 hectares [10, p. 43]. At present there are still 14 SEZs in Poland. They occupy a total area of over 15,673 hectares and the investment value of companies operating in the Polish economic zones exceeded 85 billion dollars. There were 247,451 people employed in the zones at the end of 2012. The largest capital expenditures have been incurred in the zones by investors from Poland, Germany, the United States and the Netherlands [13].

1.3 Examples of special economic zones in highly developed countries

In the so-called highly developed countries the special economic zones are established primarily to solve the specific regional or local problems, or to develop specific industries, and accelerate the development of new technologies. Due to the relatively high supply of foreign capital, there is no need to stimulate additional inflow of direct foreign investments through the creation of special

economic zones, which distinguishes the essence of the creation of zones in these countries from the developing countries [14]. For example, the reason for establishing of the economic zone in Shannon, Ireland, was the threat of job losses at the airport for several thousand people. Shannon Airport had international significance until the end of '40s of the twentieth century, because of the stopovers and refuelling of aircraft. After the introduction of jet planes - stopovers were no longer necessary. Then the idea arose to create a production zone in Shannon, and to tempt the potential manufacturers with the reliefs established there to start production. It was noted that in three years from the start of the industrial zone (1962) - the employment increased in relation to the number of jobs from before the loss of the position by the airport. Today, a special economic zone in Shannon is the most important industrial district in Ireland [15].

A major failure turned out to be the idea of setting up a special economic zone in the UK. In 1981, the government established 11 enterprise zones, and in 1983, a further 13 zones. A rich package of incentives was established, which was to encourage investors to invest their capital in regions threatened by structural unemployment. Unfortunately, most companies that located operations in the zones at the same time had eliminated the previous activities and the reason for investing in the zone were not the offered reliefs, but earlier plans. Many companies did not introduce industrial activity but trade - retail trade to that [14, p. 32]. Economic zones were also created in the United States. In the years 1981 to 1998 as many as 37 states created 230 zones economically privileged. Most often they were created by the airports, major road and rail junctions. The offer was addressed primarily to companies in the automobile, computer and information technology industry [4, p. 18].

1.4 Examples of special economic zones in developing countries

In developing countries, special economic zones played and play a more important role than in developed countries. They supported the development of specific industries and helped to solve local problems. They were and are an important tool for restructuring of the region and the country. Zones create new jobs, help in the development of exports, and bring in new technologies and management methods. They are the reason for the existence and attracting direct foreign investments. In contrast to the zones in highly developed countries, the privileged areas in developing countries constitute a sort of enclave. "Typically, the surface of such a zone is from 10 to 300 hectares (...). Companies operating on its territory rarely establish cooperative links with companies operating outside the zone. In order to avoid the threat of competition from companies operating in the zone for domestic companies, such solutions are usually implemented which require the export of goods manufactured in the zone "[14, p. 24].

The fastest and successfully established were the economic zones in Turkey. The first ones - of a service and commercial nature - were created in 1962. The success of the functioning of Turkish zones is ensured by low production costs and not very rigorous administrative and legal formalities [4, pp. 19-20].

A large number of special economic zones (so-called maquiladoras) also function in Mexico. They are mostly located near the border with the United States and constitute an important state instrument of pro-export policy and combating unemployment "[1, p. 47]. Chinese economic zones were an idea for bringing in direct foreign investment. In the thirties, China chose the strategy of economic development based on the decisions not of the market, but of the government. Enterprises did not actually make decisions in the field of investment and disposition of the effects of their economic activity [16]. Economic life of the country was formed in a completely arbitrary manner, which also concerned the area of economic relations with foreign countries "[16, p. 34]. It was not until the 1980 that the National People's Congress approved the project to create privileged industrial centres along the east coast, which a few years later resulted in a creation of four special economic zones: Shenzhen, Zhuhai, Shantou in Guangdong Province and Xiamen in Fujian province. There was a large liberalization of entrepreneurial activity in the zones, mainly due to lower costs and lower taxes. Chinese zones were very successful, because 1/3 of all investments of foreign capital in China were located in special economic zones. Total in China in 2005, there were 120 different zones, including 54 in a technological-economic development zone [4, pp. 22-23].

General and export zones have been in Thailand since 1972. They were an idea for accelerating the development of eight eastern provinces of the country. Until 2002 there were created 30 economic zones, which meant that the areas, on which they were established are today better industrialized than other parts of the country [4, p. 20]. "The biggest zone is located in Rayong and occupies 1,200 ha. There are 200 companies that conduct their activities there, which employ about 16 thousand workers (...) including 33 companies from the automotive industry, e.g. Toyota, Nissan, Mazda, Ford, and G. M. The firms which lease the surfaces and operate in the area enjoy the many investment privileges and tax reliefs"[17].

The special economic zone in Sri Lanka was established in the area of Katunayake in 1978. The activity in the clothing industry was predominant in that area [14, p. 27].

Also India, Malaysia, the Philippines, Fiji, Pakistan, Kenya, Egypt, Iran, Jordan and Cyprus have experience of economic zones. They are formed also in North and South America, Brazil, Honduras, Colombia, Costa Rica, Dominican Republic. Relatively late special economic zones began to appear in Central Europe, which was associated with the political situation of countries. Centrally controlled economy was not conducive to foreign direct investment. Economic zones in Russia have been established for 20 years and this period shall not be extended [18]. Liepaja and Rezekne are two special economic zones in Latvia, which also were created for 20 years (1997) - with the possibility of extension. In Lithuania, zones have been set up in Kaunas, Klaipeda and

Siauliai. Just like in Latvia and Slovenia, the period of transformation in Poland opened the country to foreign investments. The "Law on business with foreign capital" came into force in Poland only in 1988; it allowed for 100% foreign capital, and foreigners could set up a joint venture with Polish companies [19].

2. Conclusions

In the years 1997- 2006 there was a rapid development of the amount of economic zones in the world and in Poland. After 2006 the process of creating zones has slowed down and stabilized, though still within the zones new economic activities appear, mainly based on modern technologies. Particularly desirable in the zones is the placement of direct foreign investments, which are the reason for the development of regions and local communities, and which by creating new jobs contribute to decreased unemployment. Various reasons are related to the location of economic zones and businesses in networks, but the main reason is to alleviate administrative procedures, reduction or abolition of taxes or duties. Currently in the world there are nearly 4,000 economic zones, which employ around 30 million people.

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MANAGEMENT PRACTICES IN PUBLIC INSTITUTIONS OF THE REPUBLIC OF KOSOVO AND THE CHALLENGES OF THE PROJECT MANAGER

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Abstract: *Government and organizations usually start different projects aiming the creation of new services or improving operational effectiveness of the existing ones. Project management (PM) approach in public administration is becoming an applied tool to the implementation of various programs and public activities. Applying the tools and techniques of Project Management (PM) in the public sector is gradually becoming an important issue in developing economies, particularly in countries like Kosovo where have been undertaken projects of various sizes and structures. The paper examines the application of project management practices in the public sector in Kosovo. A big concern of the project management field and a repeated theme in the literature is that of the project success of and the factors that contribute to it. The study was conducted in the institutions of Kosovo (Municipality and Ministry) and it is widespread throughout the country. 38 copies of the questionnaire were administered to 38 public institutions of Kosovo to generate the primary data. Techniques of descriptive analysis by using percentages and presentations on the table associated with the coefficient of correlation were used for analyzing the data. The study noted that there is a deep lack of knowledge of the PM tools and techniques in public sector institutions. Also, the study recommends inter alia that the PM tools and techniques should be applied gradually, especially in government institutions where is noted a high resistance for changing.*

Keywords: *public sector, project management, practices*

1. Introduction

The project can be defined simply as "a temporary endeavor undertaken to create a unique product, service or result" (PMBOK Guide 2004, p.5). In our daily life we are constantly in the management of small projects such as personal holidays, school assignments, organizing dinners etc. Projects are considered unique in the sense that even if the objectives and results are the same they may differ in different degrees, from the context in which they operate to the uncertainty to which they are exposed and vary from project to project. Project management (PM) as a formal discipline is relatively new, has evolved in the past 60 years by a military operation during the defense programs of the Cold War (Verzuh 2005). Project management, in particular project planning, is a critical factor in the success or failure of the new product development (NPD) in projects (Patanakul et al.,2012). PM has been traditionally associated with engineering or construction projects, such as the pyramids, the Great Wall of China, irrigation systems created by early civilization, but its purpose has expanded recently. According to Crawford (2005) the use of PM to achieve the business objectives is becoming increasingly popular in organizations. Project management on the other hand, according to Abbas and El-Mharmah (2000) "is the art and science of planning, designing and management work in all phases of the project life cycle." PM is also regarded as a system or process of planning, designing, management and control of activities related to the project in order to achieve specific objectives or targets within a certain term, budget and standards (Lewis, 2007). Project management is an innovative management practice that tends to achieve the stated objectives or defined within certain deadlines and budget through optimal use of resources (Stuckenbruck & Zomorrodian, 1987).

Project managers have taken an important role in the business world and the increase of interest has caused the creation of standards and certification programs that describe practices, provide definitions, explain the main techniques and serve as basis for the assessment of competences in PM (Crawford, 1999).

Studies have confirmed that the application of modern methods and techniques of project management has a major effect on public institutions. Arnaboldi et al (2004) observed that the implementation of the project management strategy in the public sector has been the result of pressure on governments to abandon the bureaucratic organization in favor of more focused structures. In their study White & Fortune (2002) have examined the current practice of project management in the public sector in the UK by collecting data from 236 project managers in some public institutions. The survey asked respondents to judge the effectiveness of project management methods, tools, and techniques that they have used in the success of the project. The result of the study revealed that 41% of the projects reported were judged to be fully successful (using time, budget and specifications), although some shortcomings were reported. Similarly, Abbas and Al-Mharmah (2000) researched the project management tools and techniques used by the public sector in Jordan by recording 50 industrial public firms. The study found that the use of tools of project management and techniques among public sector companies has been quite low, but when is practiced efficiently will result in vulnerable benefit in all aspects of planning, and monitoring of time, cost and specifications of the projects.

In Kosovo, the application of modern tools of project management, methods and techniques has not yet reached the required level in the public sector, this results in the failure of public institutions and contractors in the performance of their duties in connection with the budget, specifications and contract deadlines projects.
Various studies have recognized the social and political systems, cultural blocks and lack of financial support as barriers to successful project planning and implementation in the public sector of Kosovo. Therefore, this paper aims to investigate the project management tools and techniques that are being used in the public sector, their benefits, obstacles and shortcomings, with the aim to recommend the appropriate action. This study has used 35 central and local public agency of the state of Kosovo.

2. Phases of project management

The project manager and project team have a common goal: to carry out the project work in order to fulfill the objectives of the project. Each project has a beginning, a middle period in which the activities move the project toward its completion, and an end (successful or unsuccessful). (Pinto 2007) identified four distinct phases of the project life cycle which are: conceptualization, planning, execution, and completion. Taken together, these stages represent the way that a project takes from the beginning to the end of it and are commonly referred as the life cycle of the project. Knowledge, skills and experience required in the project may change at any stage. During the early stages of a project, project leadership needs good conceptual skills, ability to build a team, and experience to build a project plan. During the closure of the project, project leadership ensures a high degree of motivation and attention to detail. In a big project, lasting two or more years, it is common to see the project management team to change the leadership to provide the skills that are appropriate for the final stages of the project.
Conception (Initiation) according to Pinto (2007) refers to the original purpose and developing technical specifications for a project. The scope of work is defined, necessary resources (people, money, materials and machinery) have been identified, and important organizational contributions or stakeholders have signed. A feasibility study was conducted to investigate whether each option addresses the objective of the project and a final recommended solution is determined. Feasibility issues ("can we do the project?") and reasoning ("should we do the project?") are treated. Once the recommended solution is approved, a project was initiated to provide solutions approved and a project manager is appointed.
Planning is the stage where detailed specifications, plans, schedules and other plans are developed. It is also a stage where the solution of the project is further developed in as much detail as possible and the necessary steps to meet the objectives of the project are put in place. The project tasks and resources requirements are identified, along with their strategy of the production. This is also referred as scope management. A project plan is created that describes the activities, tasks, dependencies and timelines. The project manager coordinates the preparation of the project budget; providing cost assessment for the cost of labor, equipment and materials. The budget is used to monitor and control costs during project implementation. Once the project team has identified the work, prepares the schedule and estimated costs, the three basic components of the planning process are completed. Everything that could pose a threat to the successful completion of the project has been identified at this stage. At the end, all project stakeholders must be identified at this stage of the project, in order to create a communication plan that describes the required information and the method of delivery that will be used to keep informed the stakeholders (Patel, 2008).
Execution (implementation) is the stage that deals with the actual performance of the project work. Progress is continuously monitored and appropriate adjustments are made, are registered discrepancies in order to preserve the original project plan. During the execution of the project, project tasks are performed and information is reported through regular team meetings. The project manager uses this information to maintain control over the direction of the project by measuring the performance of project activities compared the results to the project plan and take corrective actions as needed (Westland 2006). During this step, project sponsors and other key stakeholders should be kept informed about the project status. The plan should be updated and published on a regular basis. Status reports should emphasize the anticipated point of completion in terms of cost, schedule and quality of results.
Termination (closure) occurs when the completed project is transferred to the customer, project documentation is submitted, the suppliers contracts are terminated, the resources of the project are released and the closure of the project is communicated to all stakeholders. The last step is to examine what went well and what did not. Through this analysis, the experience is transferred back to the organization of a future project that will help the future management teams.

3. The tools and techniques of project management

Different tools and techniques are used in project management to a desired result. Some of these tools and techniques are Work Breakdown Structure, Gantt Charts, PRINCE 2, Project Networks (Critical Path Method and Program Evaluation and Review Techniques), Project Sensitivity Analysis, Cost Benefit Analysis, Graphical Evaluation and Review Technique (GERT), and Project Software.
Work Breakdown Structure (WBS) deals with the breakdown of projects in individual manageable components in a hierarchical structure. Such a structure defines the tasks that can be completed independently toward other tasks, allocation of resources that facilitates the assignment of responsibilities and the measurement and control of the project. Wysocki (2009) also noted that it is a real tool for defining the work packages and the development and tracking of cost and schedule for the project. WBS provides a common framework for the natural development of the overall planning and control of a project. WBS shows the relation of each task to other tasks, for all and the final product (the purpose or

objectives). It shows the division of responsibility, and identifies the necessary resources and time available, at any stage of the project management and monitoring. It is called the graph of diffraction of activities. Gantt chart is a useful tool for scheduling and project planning. It shows the graphical representation of the duration of tasks versus the progression of time. It was developed by Henry Gantt in 1915 in order to monitor the progress of projects and their tracking. Gantt charts have become a common technique for representing the phases and activities of the division of labor structure of the project (WBS) so that they can be understood by a wider audience worldwide (Wysocki, 2009). Gantt charts have a serious obstacle - the determination of the impact of an error in a task in the rest of the project is very difficult.

PRINCE 2 which means Project in Controlled Environment 2 is a process based in the method for effective project management. This is a de facto standard used extensively by the UK Government and is widely recognized in the public and private sector, as in the UK and internationally. Its features includes, focusing on business grounds, splitting the project into manageable and controllable phases, flexible implementation at an appropriate level for project management team. PRINCE 2 basically outlines the basic product planning, change control technique and quality review technique. Project sensitivity analysis determines which variables have more potential to influence in the project. Variables include the duration of the tasks, the degree of success and the costs, risks, the duration of the project, the total cost of the project and so on. It is also helpful in decisions making based on uncertainty and risk.

Cost Benefit Analysis (CBA) is one of the most widely accepted methods and is applied to the evaluation of projects for large-scale infrastructure in the public and private sector. CBA is a prescriptive approach that provides guidance on the criteria to consider decisions making, providing that the total net benefits to society exceed the total net costs (Patel, 2008). A formal CBA aligns all the planned expenses of the project, evaluates each of the tangible benefits and calculates key measurements of the financial performance such as return on investment (ROI), net present value (NPV), internal rate of return (IRR) and the return on investment period. Costs that relate to measures then are deducted from the benefits obtained. As a general rule, the cost should be less than 50 percent of the benefits and payback period should not exceed 12 months.

Graphical Evaluation and Review Technique (GERT) is a network technique that allows the conditional analysis and probabilistic treatment of the logical relationships. A type of diagram GERT- represents a system of linear equations from which a network function is set to analyze and forecast the expected system behavior (Whitehouse, 1973). It is a management beneficial tool for planning, coordination, and control of complex projects (Westland 2006). The main objective GERT is to assess on the basis of logic in the network and expected duration of the activity and draw a conclusion about some activities that cannot be performed. Despite the benefits and flexibility offered by GERT, it seems that this technique has not gained compelling acceptance in the management of new product development (NPD) and the research community (Liberatore and Titus ,, 1983).

Critical Path Method (CPM) is one of several techniques related to planning of the project. CPM is for projects that are composed of a number of individual "activities". If some of the activities require other activities to complete before they can begin, the project becomes a complex site of activities.

Program Evaluation and Review Technique (PERT) is a project management tool used to schedule, organize, and coordinate tasks within a project. It is basically a method to analyze the tasks involved in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the overall project. PERT planning involves the following steps: Identifies the specific activities and milestones, determines the appropriate sequence of activities, builds a network diagram, estimates the required time for each activity, determines the critical path and updates PERT chart during the project. PERT is a management tool designed to define and coordinate what needs to be done to achieve the target set within the allotted time. Therefore it is a decision-making tool.

4. Research Methodology

The sample selected for this study is consisted of 38 public institutions of Republic of Kosovo, such as; municipalities, ministries and public companies. The questionnaire was used as an instrument of data collection for the purpose of collecting information about project management practices in the public sector; the used tools of the project management, benefits, problems and obstacles. Relevant statistical analysis was conducted on data collected to examine the various issues of this research. The questionnaire was completed by interviewing those responsible persons for planning and project management of each sector responsible in different agencies. This method has increased the data accuracy and reliability, and can be considered 100% the response rate that is achieved in data collection. The questionnaire was developed by review of literature related to the study. He is pre-tested with ten managers of the sample size to control and to ensure that there is no irrelevant present question.

5. Results and Discussion

Table 1 has covered the personal characteristics of the respondents "such as gender, educational qualifications and work experience. The data in the table show that men represent 78.95% of respondents, while 21.05% are women. From the table, respondents with a master's degree are of the highest ranking with 55.27%, followed by respondents with bachelor's degree with 23.68%, while the rest of 21.05% have professional qualifications. As noted, all respondents are educated; it provides a solid basis for understanding a better use and implementation of techniques and project management tools. The further survey revealed that the most of the respondents have worked more than five years in institutions under study

this translates into the fact that they are based on the organization and can provide accurate information regarding the subject in question.

Table 1 Personal characteristics of the Respondents

Sex of the Respondents	*No.*	*%*
Male	30	78.95
Female	8	21.05
Highest Qualification		
Bachelor's degree	9	23.68
Master's degree	21	55.27
PhD	-	-
Professional Qualification	8	21.05
Working Experience (year)		
1-5	8	21
6-10	10	26
11-15	15	39
16-20	4	11
Above 20 years	1	3

Table 2 shows a sample for the tools and project management techniques used by employees in public institutions of the state of Kosovo. Respondents were presented with 11 options and were asked to show the techniques that had been used in projects of their agencies. Options included in the list are those found in standard texts for management projects. Respondents were encouraged to include any of the tools or techniques that are not mentioned, if necessary. Table 2 shows the percentage of frequency of use and confidential interval.
Analysis of the table shows that the Gantt's graph is most frequently used by 73%, cost benefit 68%, the statement of work 40%, the structure of the division of labor 20%, software project management 23%, as well as other techniques of decision making 16%. Sensitivity analysis of the project, PRINCE 2, PERT and CPM, GERT are some of the tools that are rarely used or not used at all by the agencies. From this we can see that the tools and techniques of project management are not yet implemented in most of the public agencies where respondents work.

Table 2 Project management tools and techniques employed

Technique/tools	*Percentage (%)*	*95% Confidence interval*
Work Breakdown Structure	20	7.28-32.72
Statement of Work	40	24.42-55.58
Critical Path Method	4	0-10.23
Project Sensitivity Analysis	3	0-8.42
PRINCE 2	-	-
Gantt chart	73	58.88-87.12
Cost Benefit Analysis	68	53.17-82.84
Programme Evaluation and Review Technique	-	-
Graphical Evaluation and Review Technique	-	-
Project Management Software	23	9.62-36.38
Other decision making techniques	16	4.34-27.66

In Table 3, were analyzed the obstacles which are faced the application of tools and techniques of project management in public institutions. As shown, the main obstacle is the lack of knowledge of project management (82%) - the majority of respondents are not well trained in the art of project management - therefore to apply the tools and techniques of PM in each project is serious problem. Other obstacles declared by respondents are: the change of authority, lack of commitment to leadership, bribery and corruption, low level of professional training in PM and rigid organizational structure.

Table 3: Obstacles facing PM implementation

Obstacles	*Percentage (%)*	*95% Confidence interval*
Lack of professional training	30	15.43-44.57
Lack of PM knowledge	82	69.78-94.22
Bribery and corruption	53	37.13-68.87
Lack of leadership commitment	21	8.05-33.95
Incessant change of authority	25	11.23-38.77
Rigid organizational structure	38	22.57-53.43

The perception of the benefits of using the tools and techniques of project management are examined in Table 4. All respondents believe that if PM tools and techniques are well implemented, it will lead to reducing the cost and time overruns and the project will have more success. As shown in Table 4, 80% believe that it will enable the monitoring of progress of the project, 62% believe it will improve better the communication, while 54% believe that the means of PM will lead to better management of resources. Other benefits claimed by the respondents are; better organization of work, set goals and objectives, better use of time and the better quality. This is consistent with the study of Abbas and Al-Marhamah (2000) which revealed that among other benefits, knowing the progress of work and having better organization of work are perceived more benefits of the application of PM tools and techniques.

Table 4 Perceived benefit of applying PM tools and techniques

Perceived benefits	*Percentage (%)*	*95% Confidence interval*
Better communication	62	46.57-77.43
Good management of resources	59	43.36-74.64
Known work progress	75	61.23-88.77
Defined goals and objectives	49	33.11-64.89
Better Quality	51	35.11-66.89
Better work organization	50	34.10-65.90
Better Time utilization	55	39.18-70.82

Table 5 shows that the high cost is a major barrier to implementation of PM tools and techniques. Other drawbacks noted by respondents were: lack of expertise, poor customer interface and difficulties to model the real world.

Table 5 Drawbacks affecting application of PM tools and techniques

Drawbacks	*Percentage (%)*	*95% Confidence interval*
Lack of expertise	71	56.57-85.43
Weak interface with customers	42	26.31-57.69

High cost of application	85	73.65-96.35
Difficulty in modeling real world	56	40.22-71.78

Table 6 shows the opinion of respondents on how to improve the implementation of PM tools and techniques in the public sector. Providing adequate training in PM for all persons in charge of projects, recruitment of professionals of project management, high commitment from the government, the establishment of the Office of Project Management (OPM) in each agency are some of the solutions suggested by respondents.

Table 6 Suggestion for improving application of PM tools and techniques

Suggestions	*Percentage (%)*	*95% Confidence interval*
Recruitment of PM professionals	69	54.29-83.71
Higher commitment from government	50	34.10-65.90
Establishment of PMO	43	27.26-58.74
Provision of adequate PM training	61	45.49-76.51

The coefficients of correlation between the different factors that can affect the level of enforcement of PM tools and techniques, obstacles and perceived benefits are analyzed and presented in Table 7. Some of the considered factors are; type of business, the cost of application, the age of the agency (institution), the experience of employees, the commitment of the government and the total number of employees. The results showed that the age of governmental institutions and commitment of the government have a negative correlation with the tools and techniques applied in PM, obstacles and perceived benefits. Therefore, we can conclude that government institutions still resist to the implementation of PM tools and techniques, and the government is not doing enough to create the tools and techniques of PM in most institutions.

Table 7 Correlation coefficients

	Applied PM tools and techniques	*Obstacles*	*Perceived benefits*
Type of business	0.392	0.512	0.392
Cost of implementation	0.451	0.405	0.211
Age of the firm	-0.511	-0.438	-0.379
Employee experience	0.684	0.527	0.264
Government commitment	-0.492	-0.498	0.388
Total number of employee	0.563	0.473	0.324

6. Conclusion

Application of PM tools and techniques in public institutions has become an important issue in many developing countries, due to its successful application in private organizations and its proven effectiveness and flexibility in achieving the goals and objectives of the project. The study of the implementation of the PM tools and techniques in the public sector in Kosovo would serve to open the eyes of the government and other creators to better plan their efforts towards effective implementation of PM tools and techniques.

If implemented properly, PM tools and techniques will result in tangible benefits in all aspects of project planning, scheduling and cost control, time and quality. Educational qualification of respondents shows that most of the sampled population are educated and provide a solid foundation for better use and implementation of PM tools and techniques.

Gantt charts, WBS and CBA are some of the applied PM tools and techniques of respondents due to their simple and understanding nature, however, the lack of deep knowledge of these tools and techniques still form a crucial obstacle. In terms of perceived benefits, the consensus is that the effective application of the means of PM will help to pursue the project, better communication and better use of resources.

To address the shortcomings, respondents believed they should be given adequate training to the workers in the art of PM; professionals must be employed in PM and must settle project management offices in all government institutions. In view of the findings of this research, we can recommend the following actions to the proper application of PM tools and techniques to local institutions, central institutions and in all public institutions in the Republic of Kosovo;

- Must be chosen organizational compatible form in order to make the implementation of PM tools and techniques in accordance with the culture and political environment of government institutions.
- Tools and Project Management techniques should be implemented gradually, especially in government institutions where resistance to change is perceived to be high.
- The government should increase its commitment to the application of PM tools and techniques in all its projects
- The professional staff, who deal with the management of projects, should be supported in all appropriate forms and not obstruct their professional work.
- As suggested by respondents, the Project Management Office should be established in all government institutions aiming the management, monitoring and control of projects improving the efficient and effective application of tools and techniques PM.
- PM adequate training should be given to employees in charge of the projects; this would increase employees' knowledge about the tools and techniques of PM. Also should be hired PM professionals to apply the proper and adequate tools and techniques of PM.
- Finally, the proper application of PM tools and techniques can serve as a tool for change. It may also be a wonderful training base for future managers and skilled workers, and to be an effective tool that will bring administrative reform in public institutions.

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THE IMPACT OF CORPORATE GOVERNANCE ON FIRM PERFORMANCE - A LITERATURE REVIEW

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Abstract: *The objective of this paper is to analyze the results of recent empirical research concerning the impact of corporate governance on firm performance and reflect potential research design problems which lead to inconsistent results. With the means of a literature review including all articles of academic journal articles with a VHB-Journal ranking from A to C, the recent empirical research articles are analyzed regarding their main results. Two main groups of studies are identified: studies on company level to determine the impact of single corporate governance variables such as board size, chairman-CEO duality, etc. on a small set of performance measures, and studies with a larger sample and a longer time period using multivariate analysis to determine the overall impact of corporate governance on companies measured with an extended set of financial research variables measuring multiple dimensions of impact. Overall, the results of recent research show no consistent impact of corporate governance on firm performance. Beside this, a trend to studies with larger samples and longer time periods can be seen. However, also these studies come to inconsistent results. The inconsistencies of empirical research may be grounded in mostly small size of samples and small time periods, and the application of research constructs instead of financial research metrics to measure firm performance. As this is a conceptual paper, the objective is to define a research design based on the findings of this analysis. Thus, the paper develops a research design for future research.*

Keywords: *corporate governance, firm performance, corporate performance, business performance*

1. Introduction

The failure of several corporations (Enron, Tyco, Parmalat, Skandia, Lehman Brothers, etc.) in the last decade made it clear that firms should undergo further modifications in their corporate governance (CG) to increase transparency and to guarantee shareholders' reliance on directors' management (Sun, Chuk and Weisbach 2012, p. 326). There seems to be a large consensus among both academics and professionals that new efforts are important to improve corporate governance practices to protect the shareholders' interests and to stabilize thus the basics of market economy due to the fact that many scholars, economic analysts and corporate practitioners have linked the severity and increasingly circular nature of financial and economic crisis to failures of corporate governance (Sun, Stewart & Pollard, 2011, p. 1; Gupta, Chandrasekhar and Tourani-Rad 2013, p. 86)

Although CG codices are introduced in many countries, they are not legally binding, but provide more or less recommendations for 'good' corporate governance. However, more and more public companies are introducing CG systems as a means of regulating stakeholder-management relations. There are many different concepts of corporate governance around the world which differ according to the variety of capitalism in which they are embedded. The liberal model that is common in the U.S. and U.K. tend to prioritize shareholder interests. The 'coordinated' model in Europe and Japan additionally recognizes the interests of employees, managers, suppliers, customers, and the community (Odenius, 2008, p. 3). Each model has its own distinct competitive advantage. The liberal (U.S/U.K.) model of corporate governance encourages more radical innovation and cost competition, whereas the coordinated model of corporate governance encourages more incremental innovation and quality.

The term 'corporate governance' summarizes efforts to optimize a company's management system and its monitoring and is based mainly on the agency theory and the problem of information asymmetries (Schillhofer, 2003, p. 11). The essence of the agency theory is the separation of management and finance, or – in more standard terminology—the separation of Management, ownership and control. An entrepreneur, or a manager, raises funds from investors either to put them to productive use or to cash out his holdings in the firm. The financiers need the manager's specialized human capital to generate returns on their funds. The manager needs the financiers' funds, since he either does not have enough capital of his own to invest or he wants to cash out his holdings.

In this context, the agency theory refers to the difficulties financiers have in assuring that their funds are not 'wasted' on unprofitable projects. In general terms, financiers and managers sign a contract that specifies what the manager does with the funds, and how the returns are divided between him and the financiers (Rani & Mishra, 2008, p. 24). A materialization of this mostly implicit contract between principal and agent is a corporate governance code that defines the mechanisms, processes and relations by which corporations are controlled and directed.

Agency problems may arise from (1) the separation of ownership and management or (2) from conflicts of interest between controlling and non-controlling shareholders. Governance structures in form of a corporate governance codex should identify the distribution of rights and responsibilities among the corporation's different stakeholders such as the supervisory board, management board, shareholders,

creditors, auditors, regulators, and others and should include rules and procedures for decisions making in corporate affairs. Furthermore, corporate governance includes the processes through which the corporation's objectives are defined and pursued in the context of the social, regulatory and market environment. Governance mechanisms include monitoring the actions, policies and decisions of corporations and their agents. Therefore, the main characteristics of corporate governance systems include definitions and regulations concerning (1) ownership structure, (2) supervisory board characteristics, and (3) management controlling regulations.

According to the agency theory (Jensen & Meckling 1976), a positive relationship between corporate-governance and company performance should exist which is to be clarified in this paper that is structured in two parts: Section 1 ("Approach") defines the basic requirements to measure firm performance and clarifies the approach applied in the literature review. Section 2 ("Results") provides and discusses the literature review's results. The paper closes with Conclusions and Recommendations relative to an improved a research design.

2. Approach

Well governed firms should have a higher firm performance and value. Here, the question arises what performance and value really means. Milton Friedman and Peter Drucker may be helpful testimonials. According to Friedman, it is in the responsibility of a company's management "to use the resources to generate income and thus delivering benefit for owners, because they are the stakeholder group which really took over risk. Due to taking risks, the reward is the return on equity for which managers are employed by owners" (Friedman 1970, p. 32) Managers are employed to increase the owners' profits (Friedman 1970, p. 32). In contrast to Friedman, Drucker states that profit is not a goal but "a measurement of how well the business discharges its functions in serving market and customer" (Drucker 1993, p. 64, 98-99). Thus, Drucker and Friedman define implicitly and explicitly three main metrics to measure whether management fulfills its functions: profit, return on equity, and market success. In terms of financial research, the appropriate metrics are *revenue (and market share)* as measurement for 'market success', *net income*, *earning per share* and *return on equity* for 'profit'. According to these reflections, the main benchmark for evaluating empirical studies in this paper is the application of such basic metrics to measure performance.

Due to the objective of this paper, which is the accumulation and discussion of research findings concerning the link between corporate governance and firm performance, the application of these 'meta'-metrics may be seen as basic requirement to define performance in the context of corporate governance in the sense of the theory of the firm (Brigham and Ehrhardt 2013, p. 592). The following literature review is based on the academic journal data bases from Sage, Elsevier, Wiley, EBSCO, and Tayler Francis. Only articles from "A" and "B" journals, according to the VHB Journal ranking, are included. Additionally, only empirical studies conducted in 'western' advanced economies are used. The keywords for identifying relevant articles are 'firm performance', 'financial performance', 'corporate governance' and 'impact'.

3. Results

Dalton et al. (1998) stated in a meta-analysis of empirical studies that both the supervisory board composition (insider/outsider proportion) and as well as leadership structure do not have any effect on financial performance (Dalton et al. 1998, p. 282). Since then, further studies have been published which come to different results.

Table 1: Findings on Correlations between ‚Good CG' and Firm Performance

Positive Correlation
Jensen (1986); Hermalin & Weisbach (1991); Byrd & Hickmann (1992); Lipton & Lorsch (1992); Jensen (1993); Brickley et al. (1994); Eisenberg, Sundgren & Wells (1998); Hossain, Cahan & Adams (2000); Gompers et al. (2001); Demsetz & Villalonga (2001); Chung, Wright & Kedial (2003); Callahan, Millar & Schulman (2003); Mak & Kusnadi (2005); Krivogorsky (2006); Brown and Caylor (2006); Nicholson and Kiel (2007); Larcker et al. (2007); Bhagat and Bolton (2007); Sunday (2008); Daines et al. (2008); Carline et al. (2009); Renders, Gaeremynck & Sercu (2010)
21 empirical studies
No Correlation
Grove et al. (2011); Brenes et al. (2011); Castaner and Kavadis (2013); Shank, Hill and Stand (2013); Gupta, Chandrasekhar and Tourani-Rad (2013)
5 empirical studies
Negative Correlation
Bathala & Rao (1995); Hutchinson (2002); Bauer et al. (2004); Giroud and Mueller (2010)
4 empirical studies

Regarding the synopsis in Table 1, the first impression is that, overall, a positive effect of corporate governance on firm performance must be assumed. However, the number of studies which determine no or a negative impact is not negligible. Therefore, it is necessary to analyze the variables set and the size of samples to examine whether the research design of the mentioned studies explains the more or less inconsistent research results.

Most of the studies listed in Table 1 do not use a standardized general measure to define 'good' corporate governance. They measure single aspects of a corporate governance system such as the leadership structure (Castaner and Kavadis 2013), board ownership (Carline et al. 2009), or board independence (Nicholson and Kiel 2007) and their impact on firm performance. Some studies determine a relationship between only two variables, such as financial performance with board or management structures (Hermalin & Weisbach 1991; Krivogorsky 2006; Demsetz & Villalonga 2001). The findings of such studies with a reduced set of variables are mostly that a single aspects of a corporate governance has a positive impact, others not. Brenes et al. (2011), for example, determine that the more intensive the evaluation of management performance by the board is, the better is the company performance to vis-à-vis competitors. Castaner

and Kavadis (2013) note, that leadership structure has positive impact: a "chairman-manager non-duality"[1] increases the financial performance. Carline et al. (2009) state that "board ownership"[2] shows a positive impact on company performance. Nicholson and Kiel (2007) also show that an "independent board" has a positive impact on firm performance.

Others, such as Bauer et al. (2004), Larcker et al. (2007), Bhagat and Bolton (2007), Daines et al. (2008), Renders, Gaeremynck, and Sercu (2010), and Gupta, Chandrasekhar and Tourani-Rad (2013), use corporate governance rankings to compare the corporate governance 'culture' of countries, in which companies are embedded, with the overall performance of companies in this country. Thus, they are not interested in measuring the impact of single aspects of corporate governance of on company performance.

Some studies use a very small sample. Only Bauer et al. (2004), Brown and Caylor (2006), Bhagat and Bolton (2007), Daines et al. (2008), Renders, Gaeremynck and Sercu (2010), and Gupta, Chandrasekhar and Tourani-Rad (2013) use samples with more than 250 companies. Taking this into account, the ratio between studies stating a positive impact and studies with neutral or negative impact shows a relatively balanced ratio.

Additionally, most studies examine only short time periods from two to four years. Only Gompers et al. (2001) examine a longer time period (from 1990 to 1999). Therefore, it seems to be questionable if such short-term studies really measure what they pretend to measure: performance is not a spot check. The performance of a company cannot be measured at a single time or a year. Thus, relevant metrics such as revenue growth year-over-year, market capitalization growth year-over-year, etc. cannot be applied to level the impact of outlier data and to really measure performance.

In summary, most studies use a small set of variables in particular in respect to measuring firm performance, and determine only the relationship between single aspects of corporate governance with one or two firm performance variables. Almost all studies use a very short time period. Only two studies differ in all these points from all other studies. Renders, Gaeremynck, and Sercu (2010) apply a comprehensible set of typical standard metrics of financial research such as P/B ratio (price-book ratio), ROA (return on assets), P/S ratio (price-sales ratio), ROE (return on equity), market capitalization, etc. in relation to corporate governance rankings, and monitor across-country sample, including stock listed companies from the 16 largest countries of the EU, in a time period of four years. They expected a positive relationship between the corporate-governance rating of the companies' countries and company performance, assuming that companies from countries with a higher corporate governance rating show better corporate-governance practices and thus a better operating and financial performance and a higher market value. Their multivariate analysis shows that this is indeed the fact: The "coefficient of corporate-governance ratings has a highly significant positive effect on performance" (Renders, Gaeremynck, and Sercu 2010, p. 100). Their main conclusion is that companies can improve performance by adhering to 'good' corporate-governance practices (Renders, Gaeremynck, and Sercu 2010, p. 100). According to Renders, Gaeremynck, and Sercu (2010) this clear evidence is only possible when a larger set of financial accounting variables is applied in the combination with corporate governance indices and a longer time period (p. 100-101).

The second study with a multivariate approach, an enlarged variable set, financial analysis metrics, and a longer time period originate from Gupta, Chandrasekhar and Tourani-Rad (2013). They used a large set of variables including such variables as CAPEX, financial leverage, revenue, P/B ratio, ROA etc. in a multivariate analysis. Gupta, Chandrasekhar and Tourani-Rad (2013) determine that well-governed firms do not outperform poorly governed firms in particular in the financial crisis. The cross-country sample consists of 2,704 companies from 27 economically leading countries worldwide. The main result is that 'good' corporate governance, measured by the corporate governance rating of a firm's country, has no impact on firm performance on country-level (Gupta, Chandrasekhar and Tourani-Rad 2013, p. 97-98). They conclude that the wide-held belief that corporate governance failure explains market price or firm performance cannot be verified (Gupta, Chandrasekhar and Tourani-Rad 2013, p. 107).

4. Conclusions and Recommendation

Summarizing, it can be stated that a lot of studies examine only small samples with a restricted set of variables which are mostly not standard financial research variables. Secondly, they state only moderate correlations between single differences in corporate governance variances and mostly one performance metric. Only two studies differ in this regard. Both studies differ in their results: Whereas Renders, Gaeremynck, and Sercu (2010) find a positive correlation between 'good' corporate governance and financial performance of a firm, Gupta, Chandrasekhar and Tourani-Rad (2013) cannot confirm a positive relationship.

Therefore, further research should examine the degree of deviations from CG codices as a measure for 'good' corporate governance and its relation to market and operating performance on company-level. A wider set of variables should be used, containing only standard metrics of financial research. Therefore, the recommendation for further research is:

- Samples with a higher number of companies (> 200) should be examined.
- To compare real differences between companies, and not between groups of companies in relation to the corporate governance country ranking, a sample should be differentiated in terms of variations in the company-specific corporate governance.
- The performance metrics should not be research constructs, but standardized financial research metric.
- The following variables should be measured for comparing companies:

[1] CEO and chairman of the board are not represented by the same individual.

[2] Owner are also board member.

Table 2: Recommended Variables Set

Variable Groups	*Variable Subgroups*	*Variables*
Performance	Management Efficiency	ROA, ROE, Financial Leverage, ROIC, Receivables Turnover, Inventory Turnover, Fixed Assets Turnover, etc.
	Growth	Revenue Growth, Operating Income Growth, Net Income Growth, etc.
	Cash Flow	Operating Cash Flow Growth, Free Cash Flow Growth, etc.
	Value	Market capitalization, Price-earnings Ratio (P/E Ratio), EVA (Economic Value Added), EVA Growth
Corporate Governance 'Quality'	Supervisory Board Composition	Board Size, Board Process (frequency of meetings, etc.) Responsibilities, Composition, Quality of Targets, Nomination Procedure, Remuneration Policy, etc.
	Chairmen Status	Existence of rules for appointment and removal of Chairmen, existence of a definition of the Chairman's role and his responsibilities, existence of an information policy process
	Audit Committee	Composition, Definition Auditing Process, Frequency of meetings, etc.), Nomination Procedure, Reporting Frequency, Definition of Control Procedures, etc.
	CEO Status	Existence of rules for appointment and removal of CEOs, existence of a definition of the CEO's role and his responsibilities, existence of an information policy process definition, etc.
	Ownership Structure	Number of Owner, Ownership structure, Regulations concerning Role of Owners
	Auditing Indicators	Frequency of auditing, Key Performance Indicators (growth, value, etc.)
	Corporate Governance Codex	Measuring the deviations from the country corporate governance codex as number of deviations in total and as number of deviations concerning critical aspects such as the existence/non-existence of a audit committee, etc.
	Communication with Shareholders	Definition Communication Policy, Frequency General Meetings

The multivariate comparative analysis of companies of only one country may lead to clearer findings concerning the variations of corporate governance practices and financial performance of companies subordinated to comparable regulatory environments and corporate governance codices of one country to exclude intervening variables such as the regulatory environment or accounting 'cultures'. Only then, in a second step, a cross-country analysis which includes corporate governance country indices seems plausible.

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VALIDITY AND RELIABILITY OF PERSONALITY TESTS

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Abstract: *The purpose of this study is to determine the most valid and reliable personality type test in order to be able to set up an empirical study to connect personality types with motivational factors. The ultimate aim is to establish motivational factors that would lead to an increase in productivity and efficiency in certain specific personality types.*

Keywords: *motivation, personality type, validity, reliability, performance*

1. Introduction

Personality predetermines the variance of motivation factors to 20-30%. [6] A meta-analysis has shown that such personality tests as Big Five could be used as an important source of performance motivation.[6, 11]

Since there are dozens of personality type tests in existence and the number is still growing, it is quite important to choose the most appropriate and valid one in order to conduct proper research. Therefore the author's main priorities for conducting this research is to choose the most reliable and valid personality type test in existence as well as to analyse motivational factors and how they are related to certain behaviour and personality types.

2. Motivation

"Personality refers to an individual's characteristic patterns of thought, emotion, and behaviour, together with the psychological mechanisms—hidden or not—behind those patterns."[5]

As mentioned above, personality predetermines the variance of motivation factors to 20-30%.[6] Authors also argue that for example extraverts could be motivated by intrinsic factors, such as recognition, positive feedback or other reward factors, whereas introverts will be motivated to avoid punishment. [5] Extrinsic traits have a positive impact on creativity, whereas intrinsic traits have an impact on innovative behaviour. [1]

From the point of view of behavioural theory the decisions individuals make are influenced by their values and believes. From this point of view personality characteristics play an important role in behaviour. Individual's characteristics are responsible for the way an individual perceives a world, including working environment. Existing research on the influence of personality on motivation is divided into two main trends, which sometimes are interconnected, namely a link between personal traits and job satisfaction [5, 6] and a link between personal traits and achievement motivation. Herzberg examined in his work the relationship between motivation and job satisfaction. [10] He suggested a two-factor model of motivation, which proposes that dissatisfaction is not the opposite of satisfaction, but means absence of satisfaction. He distinguishes between two facets of work "hygiene factors" and "motivators". Hygiene factors are based on extrinsic approach to motivation and could lead to employee dissatisfaction, if they are not met. Hygiene factors include supervision, working conditions, company policies, salary, and relations with co-workers. Motivators are based on intrinsic approach to motivation and include aspects such as achievement, development, responsibility and recognition. [6] Developing the two-factor model of motivation, Furnham [6] points out an important role of intrinsic factors such as recognition and positive feedback as motivating factors for extraverts. Furnham [5] analysed the relationships between personality and work values. They found out the motivator factors were positively associated with extraversion and negatively with openness. Hygiene factor were negatively associated with both extraversion and openness. [5, 6] Furnham [5] points out that job satisfaction is higher for individuals that have higher score in openness. This let them be more innovative and learn new skills. According to researchers, work vales and attitudes are accounted to 40% by genetic factors [6], and may stay stable despite the changes of occupation and employers.[21]

Other researchers focus on the analysis of the relationship between personality and achievement motivation.

Cassidy and Lynn [22] developed a system to measure achievement motivation. They propose seven dimensions. Work ethic refers to the desire to work hard, which effect a person's values, attributes and behaviour [22]. Pursuit of excellence refers to the desire to perform the best personal results in order to achieve the personally defined standard of excellence. Status aspiration refers to evaluation of an individuals' status in view of others and is inspired with the desire to be a leader and to achieve a certain hierarchical status. Dominance, which sometimes is described as a part of status aspiration, has been identified as a separate factor referring to be in a position of authority. Competitiveness shows a high desire to compete with the ultimate goal to outperform others in the competitive task or activity. Acquisitiveness for money and material wealth refers to socio-economic status, which can be achieved by means of money and other material objects. Mastery in nature is similar to competitiveness but

with oneself instead of with others. Difficult tasks and problem solving are functioning as motivation factors.[22]
Furthermore, the system explored by Cassidy and Lynn [22] could be integrated into a widely used two-dimensional model of achievement motivation, intrinsic and extrinsic motivation.[9] The status aspiration, dominance, competitiveness, and acquisitiveness measures fall on extrinsic motivation, whereas mastery, work ethic, and excellence fall on intrinsic motivation.[9]
Developing further this approach, Deci and Ryan (2008) differentiated autonomous and controlled motivation. Autonomous motivation is based on internal demands through willingness and sense of choice. Controlled motivation is based on external demands through pressure or demand. Autonomous motivation plays an important role in feeling of satisfaction, and helps to achieve effective performance in education, work, sport or other activities.[23] Elliot and Dweck [4] developed the theory of motivation identifying two types of motivation. Achievement motivation is focusing on completion of tasks, which are characterised by moderate challenges and risks. Competence or self-efficacy motivation is derived from the belief that people can solve difficult tasks in their own ability. [4]
The literature review has shown a fair amount of research on the relationship of personality traits and achievement motivation in education or among students. [9] Hart, Stasson, Mahoney & Story, P. [9] examined the relationship between Big Five and achievement motivation. The study examined 777 students. The researchers have found out that "...[c]onscientiousness, openness, and extraversion were positively associated with intrinsic achievement motivation, whereas extraversion, conscientiousness, and neuroticism were positively related to extrinsic achievement motivation." (p. 267). [9] In a further study Rahman [17] has examined 180 undergraduate and postgraduate students, and have found that "[a]mong the personality factors, PG students seem to have more agreeableness, conscientiousness and openness and they also show lesser neuroticism. Among the UG [undergraduate] students, openness and neuroticism were found to be positively correlated with achievement motivation" (p. 40). Rahmen [17] made some gender comparison, the results of which have shown that women are more achievement oriented than men, whereas conscientiousness and openness have higher score among men. "For women; extraversion, conscientiousness and openness and for men, agreeableness and conscientiousness correlated with achievement motivation." (p. 40).[17]
Smola and Sutton [20] argue that the social context in an individual has an impact of an individual's attitude towards authority, their understanding of organisations, the value of work define goals of work and shape work ethic. This is being confirmed by the finding of Wong, Gardiner, Lang & Coulon [26], who identified a relationship between socio-cultural context and personality development. They argue that social context of every generation impacts the value of work and individual's expectations from work.[26]

2.1. Personality and Leadership

One of the biggest questions in management is, whether leaders are born to be leaders, or whether these skills could be acquired.
Furnham [6] found out that high scores in extrinsic rewards (such as pay and bonuses) were negatively associated with job status. The reason for that is that for those who are lower in the hierarchy, hygiene factors are more important than for those, who are higher up in status However, those who are higher in status accept hygiene factors as granted, and for them power and status - or motivators - are more important. This goes in line with the Maslow theory of motivation.
As a rule, leadership is connected with taking risks. Several researchers analysed the correlation between personality and risky behaviour.
Tok [23] found out a positive correlation between readiness to take risks and extraversion and openness, and a negative correlation with conscientiousness and neuroticism.
Seibokaite and Endriulaitiene [19] analysed the impact of personality traits on risky behaviour, particularly on driving behaviour. They found out that conscientiousness is positively associated with risky behaviour. Conscientiousness showed a strong correlation with higher levels of work motivation and higher levels of perceived safety climate. Less risky behaviour was associated with extraversion, agreeableness, conscientiousness and lower levels of neuroticism. Seibokaite and Endriulaitiene [19] explain this with high social responsiveness, performance norms, low aggressiveness and sociability of individuals with high score in these traits.

2.2. Reliability and validity

The main criteria to judge the worth of a test are validity and reliability. However, many tests fail on both criteria. For example, according to the survey of the Federal Office of Technology Assessment, 73% to 97% of people who fail integrity test are incorrectly classified as dishonest. [25] Several researches [27], which have been taken recently, do not show high validity score of such tests. A meta-analysis of personality tests published between 1964 and 1982 showed relative low levels of validity (about 0.2). [3] Ghiselli [8], by analysing the validity of tests for personnel selection, has concluded that personality tests can only predict the level of proficiency likely to be attained by executives, but they are less useful for foremen. Ones [15] analysed personality tests from the point of view of predictors of performance. This analysis showed a positive correlation. Reddock [18] refers to two factors that could enhance the validity of personality tests - namely the frame-of-reference (FOR) and intra-individual or within-person variability.
Other tests fail on reliability criteria. For example, three-quarters of the Myer-Briggs-test takers are assigned to a different type when re-taking the test, although the test claims to test their inborn, unchanging personality types. [16]

In order to understand the complexity of concepts of validity and reliability, the following theoretical overview of these two constraints needs to be provided.

2.3. Reliability of personality tests

Test reliability consists of two parts: a test-retest reliability, which refers to the outcome stability over time, and internal consistency reliability.[13] Research measuring a mood can have perfect internal consistency but poor retest reliability. Conversely, a research measuring such data as date of birth, social security number, height or weight is an example of a scale with low internal consistency but near-perfect retest reliability, because they might stay constant for many years.[14]

Test-retest (or just retest) reliability is scored in a rage from +1 to -1. The higher the correlation coefficient, the more similar the tests are. If the correlation equals to 0, there is no relationship between two sets of scores. In general, test-retest reliability of most psychological test is less than one. This can be explained by several factors. [13]

Time gap: if test takers will retake a test after a short period of time, they can remember the expressions, and therefore the test-retest reliability will be low. In order to avoid that, researchers suggest retaking the test not earlier as three months.

Changes of the test subject: in a gap period between the tests some changes of subject can occur, and the results may differ from the previous attempt.

Subject group: it is important to provide a retest to the same (sample) group. For example, if the first test has been done by jobseekers, and the second test by managers, the test-retest reliability will be low, as it does not cover the same target group.

Subject group size: in order to reduce a standard error, the group size should be sufficiently large. Kline (1999) suggests using groups of at least 100 participants.

Measurement error: such factors as uncomfortable chair, a poor pen or headache or just fatigue may lower test-retest reliability scores. Poor test instructions, subjective scoring or guessing only increases confusion of a test taker and lower the test-retake reliability score.

Internal consistency reliability reflects the cohesion of the components of a test.[14] The most common measurement of internal consistency is coefficient (Cronbach's) alpha, which (according to researchers) should be at least .07 or even .09 in order to provide high validity of a test.[13; 14]

Coefficient alpha is represented by a formula:

$$r_{tt} = \frac{n}{n-1}\left(1 - \frac{\sum_i p_i q_i}{{\sigma_t}^2}\right); \text{ (i=1,2,3,…n).}$$

where:

r_{tt} = the alpha coefficient of attest of n items;

n = the number of items;

$\sum_i p_i q_i$ = the item variance;

${\sigma_t}^2$ = the test variance [2; 14]

For good tests, high internal consistency reliability is desirable but not sufficient.

4.2. Validity of personality tests

Validity is a much more complex constraint. Generally, a test is valid if it measures what it claims to measure.[13] There is no widely approved coefficient to calculate validity. A test is always made for some purpose and certain conditions, which differ from test to test. [13]

Researchers distinguish several types of validity:

Face validity: Face validity means that a test appears to be measuring what it claims to measure. [13] The problem with this is that test-subjects are able to guess what a face-valid test is measuring. Therefore personality tests are structured in a way, that they have a lack of face validity and still possess general validity. [24]

Concurrent validity: "A test is said to possess concurrent validity if it can be shown to correlate highly with another test of the same variable which was administered at the same time." [13]

Predictive validity: refers to the extent to which scores from the test are able to predict some criteria or other. [13]

Content validity: enables to measure the extent of content representativeness. Sometimes it might be overlapping with face validity, but it represents a different aspect. For example, the question "Do you sometimes feel anxious, for no particular reason?", the face-valid item is the measurement of anxiety. However, this anxiety can be distorted by deliberate lying, by imperfect self-awareness, or by ignorance. A fearful subject might put some negative result. [13]

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IMBALANCE OF THE PUBLIC FINANCE IN THE CONTEXT OF KEYNESIAN AND NONKEYENSIAN EFFECTS OF FISCAL POLICY LIMITATION

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Abstract: *The purpose of this article is to point out the importance of the size of public debt and deficit in the context of Keynesian and non-Keynesian effects of fiscal policy limit. To achieve this objective primarily were used methods of analysis of the available literature and presentation of statistical data. Considerations include, among others, the presentation of public debt and deficit in the context of economic growth. Expansionary fiscal policy often caused by economic fluctuations contributes to the deepening of public finance imbalance with frequent decline in GDP growth. The restrictive policy influences on improving the situation of the public finance sector in the long-term with at least moderate economic growth.*

Keywords: *fiscal policy, public finance imbalance, financial crisis*

1. Introduction

In the economy, there are mechanisms that cause the budget deficit is formed in a pro-cyclical way [1], [2]. This is a relatively common phenomenon. As shown by empirical research, as far as fiscal policy in developing countries tends to be pro-cyclical, so in the G7 countries, fiscal policy is conducted in a rather anti-cyclical way [3]. Similar results of studies conducted on different samples reached the Lane [4], Alesina, Tabellini [5] and others. C. Adam and D. Bevan indicate that sustained in the long term budget deficit contributes to a slowdown in economic growth [6]. C.Reinhart and K.Rogoff give significant results of the analysis covering 44 countries highly economically developed and developing countries. In their opinion, the high level of public debt in relation to GDP (over 90%) is associated with lower levels of GDP growth [7]. Disputes about the negative or positive impact of the public finance imbalance on the growth are taking place for many years, but recently has been intensified. Hence, the purpose of this article is to point out the importance of the size of the general government debt in the context of Keynesian and non-Keynesian effects of fiscal policy limitation.

2. Reflections on Keynesian and NonKeynesian effects of limiting public finances

Public debt is a consequence of the budget deficit (a negative balance of the consolidated balance sheet of the public sector). The literature mentions several reasons for the budget deficit among others: 1) between budgetary expenditure and revenue from taxes and other sources, there is a lack of synchronization; 2) too extended functions of the state; 3) between the tax burdens which do not reduce the rate of economic growth and the size of government spending is difficult to find the optimum relationship; 4) adverse demographic trends; 5) use of fiscal intervention in the conditions of economic recession, for example: "Fiscal packages"; 6) often politicians in pre-election declarations consist society promises that at the moment of require of funds they are higher than obtained in a natural manner through taxes;7) over developed welfare state mainly in relation to GDP growth and ability to raise budget revenues (excessive social policy, social privileges) [8]. Occurring in the economy, the budget deficit and public debt impact on economic growth in different ways. Many economists have on this completely different opinion and theories. One of the popular models describing the influence of Keynesian demand of the public sector on economic growth is P. Samuelson model. Based on the model it was noted that the increase in demand of the public sector contributes to GDP growth, while the decline in the demand by tightening fiscal policy to drop the product. In this model, it is assumed that the total demand is below the potential level, and the prices have excellent rigidity. Hence with such assumptions the aggregate demand determines the amount of product in the economy. Therefore, higher public spending *ceteris paribus* cause an increase in global demand and product, and lower public spending, *ceteris paribus*, lead to a decline in global demand and product. In addition, in the model Samuelson is pointed out that the increase in savings contributes to the decline in demand, *ceteris paribus*, a decline in savings causes an increase in demand, this is called. the paradox of savings. Model Samuelson and other Keynesian models are used in the analysis of economic processes in the short term. As a result of fiscal expansion (increase in budgetary expenditure), occurs the output growth in the short term - but this does not mean growth in the long term. This is due to the fact that economic growth in the long term, influenced by fiscal factors such as : the structure of public expenditure, the level of public spending, the amount and types of taxes and the scale of imbalances in public finances [9]. In the 80s of the twentieth century, there have appeared studies on the positive effect of reducing public spending or raise taxes on the growth of aggregate demand in the short term. These studies related to non-Keynesian effects of fiscal tightening that can occur when public finances stand before the crisis, taxes are high and despite the public debt is growing rapidly. It turns out, however, that to

appearance the Keynesian effects may lead the sufficiently strong deficit reduction. In the literature, there are also opinions that the occurrence of non-Keynesian effects of the tightening of fiscal policy significantly influenced not the size of the original imbalances in public finances but rather a way of their reduction. Deficit reduction may be accompanied by acceleration of the product, not by raising taxes, but by cuts in expenditure, mainly in spending on public sector wages and social transfers [10]. An interesting model describing non-Keynesian effects of fiscal tightening is, among others, model O. J. Blanchard (1985.1990) [11], [12]. This model connects non-Keynesian effects with changes in the uncertainty felt by households caused by fiscal impulses. In this model, the probability of the occurrence of uncertainty of households is addicted to not only the rate of tax burden and public debt levels but also on the degree of development of the financial system or the horizon of maximizing of the utility by the household [9]. Analyzing the assumptions of Blanchard model should be noted that households may have a certain myopia that results from continuous risk of death or expiration of the family, or the underdevelopment of the financial system, which in turn prevents the smoothing consumption over time. Decisions taken by households are within the range of choices from the Keynesian (only the current period) to the Ricardian (infinite time horizon). Among the assumptions in the model is also listed zero level of tax rate, which the exceeding result in the permanent decline of the product. Moreover, in each period the probability of carrying out consolidation of public finances is the same. The consolidation is understood as a reduction of the deficit, which will affect the stabilization of the public debt in relation to the product. Taking this into account, tax increase produces two effects: a) First of all it is related to the increase in the expected value of lifelong household assets, which determines their consumption possibilities. It also allows you to stop the accumulation of public debt to the size at which it would be necessary to raise tax rates to a level causing abnormal lowering the product; b) Tax increase ensures households in the current period that taxes will not increase in the future above the critical level. However, such an increase, assuming maximizing the utility by households in a finite time horizon, is the same as the increase in the expected value of the total tax burden. With the deposition of consolidation are increasing the chances of at least a partial shift of the debt cost for the next generation. As a result, the first effect dominates the effect of the other. This is due to the fact that tax increase contributes to the growth of private consumption and aggregate demand only in extraordinary circumstances - i.e. when bringing closer an extraordinary expense in the process of balancing public finances (public debt reaches high levels and still increases despite the tax rate close to the critical value). A. Rzońca adds that the range of tax rates, in which achieve fiscal balance as a result of tax increases could lead to an increase in private consumption, is relatively narrow [10]. Based on the model of Blanchard it can be concluded that the fiscal tightening rarely may lead to non-Keynesian effects, so to an increase in aggregate demand. In order for that to happen, the rate of tax burden and public debt should be at a sufficiently high level. Then a further tax increase may contribute to non-Keynesian effects [13]. Among other Alesina and Perotti [14]; Alesina and Ardagna [15] or Alesina, Ardagna, Perotti and Schiantarelli [16], who conducted empirical research on non-keynesian effects of fiscal tightening, emphasized that the increase in aggregate demand in the time of consolidation of public finances seems more likely if they are balanced by cuts in public spending and not by raising taxes. On the base of the modified model of Blanchard can be concluded that the probability of non - Keynesian effects of fiscal tightening is higher in countries where: 1) the financial condition is bad, the public debt is substantial and it continues to grow despite high taxes; 2) Households are aware of the impossibility of postponing fiscal consolidation and thus they know about the negative consequences for the level of the product by raising taxes; 3) the persons responsible for fiscal policy - according to households - as the only form of balancing the budget they see an increase in taxes (and not a limitation of expenditure); 4) as a result, the government surprises households and reduces the level of state spending. Thus, the reduction of public expenditure does not mean worse results than a tax increase. [13] In the short term reduction of the deficit in public finances may reduce the rate of economic growth but not always which is indicated by the theory and empiricism.

3. Analysis of economic situation in Poland, with particular emphasis on public finances

Recent economic and financial crisis, which began in 2008 contributed to the need to pay attention to the public finances of many countries. Typically, the tendency to increase budget deficits and debts of public finances are intensified by the recession phenomena. In order to analyze the situation of public finances and the size of the economic growth in Poland, are presented in Table 1 of revenue, government expenditure and the general government deficit and GDP in Poland in the years 2000-2014 in current prices.

Table 1 Public finances revenues and expenditure, General Government deficit and GDP in million zloty, in Poland

Year	*Public finances revenue_nominal*	*Public finances expenditure_nominal*	*GG DEF_nominal*	*GDP_nominal*
2000	271 641,9	293 115,8	-22 194	747 032
2001	291 491,0	329 682,6	-37 309	779 975
2002	304 822,9	351 064,8	-39 280	810 617
2003	319 955,5	365 252,8	-51 408	845 930
2004	345 933,7	387 834,6	-47 796	927 306
2005	382 496,8	412 130,7	-39 288	984 919
2006	420 411,1	442 609,5	-38 228	1 065 209
2007	484 853,3	483 182,4	-21 972	1 186 773
2008	515 204,6	535 837,6	-46 369	1 277 322
2009	539 890,2	590 019,8	-99 666	1 361 850
2010	551 098,5	635 774,3	-109 728	1 437 357
2011	604 203,0	660 082,1	-76 174	1 553 582
2012	651 121,5	689 280,6	-60 433	1 615 894

2013	650 315,1	699 177,5	-66 735	1 662 052
2014	677 159,0	716 857,5	-55 241	1 724 723

The largest increase in the deficit of the general government in Poland took place during the financial crisis in the years 2009 - 2010. Then the increase in spending was much higher than the increase in public revenues. In the years 2000 - 2014 only two times the general government deficit was below 3%, which meant meeting the fiscal rules. In Poland there are fiscal rules contained at international level, namely *the Treaty on European Union (Maastricht Treaty)* of 7 February 1992 and the accompanying *Protocol on the excessive deficit procedure*. They set the maximum level of public debt at 60% of GDP at market prices and the deficit at 3% of GDP at market prices [17]. On the other hand, national fiscal rules have been enshrined in *the Constitution of Republic of Poland* of 1997 and in *the Public Finance Act*. In *the Constitution* was placed a provision that prohibits the granting of loans or guarantees and financial sureties in the aftermath, the amount of public debt would exceed 3/5 of GDP [18]. Similarly, the Public Finance Law stipulates that the public debt cannot exceed 60% of the annual GDP [19]. In periods of decline in GDP in the economy were also noticeable increases in deficits of general government (although the increase in the deficit of public finances was a factor mitigating the impact of the crisis on the Polish economy). In 2009 this deficit was 7.3% of GDP and in 2010 already 7.6% of GDP. This debt began to fall in 2011 from 4.9% of GDP to 3.2% of GDP in 2014 (Table 2). The increase in the deficit of public finances among others, had its roots in the activities of anti-crisis measures of the government. Fiscal authorities reduced the burden on social security contributions, tax and administrative barriers, and increased spending on public investment.

Table 2 General Government debt and deficit and GDP growth (% GDP) in Poland

Year	*GG debt*	*GG deficit*	*GDP_growth*
2000	-36,5	2,97	4,3
2001	-37,3	4,78	1,2
2002	-41,8	4,85	1,4
2003	-46,6	6,08	3,9
2004	-45,3	5,15	5,3
2005	-46,7	3,99	3,6
2006	-47,1	3,59	6,2
2007	-44,2	1,85	6,8
2008	-46,6	3,63	5,1
2009	-49,8	7,32	1,6
2010	-53,60	7,63	3,9
2011	-54,80	4,90	4,5
2012	-54,40	3,74	2,0
2013	-55,70	4,02	1,6
2014	-50,10	3,20	3,3

Observing the dynamics of economic growth in Poland since 2000 we notice that while in 2000 recorded the growth of 4.3%, in 2001-2002 there was a drop in GDP and fluctuated between 1.2-1.4% . In subsequent years 2003-2006, GDP in Poland was on a path of moderate growth reaching even in 2006 the level of 6.2%. Analyzing the level of GDP in Poland, especially in the period approaching the financial crisis it must be noted that from 2007 onwards. Until mid-2008 observed a relatively high level of GDP, oscillating in individual quarters in the range from 7.5% to 6.1% and the average from 6.8% in 2007 to 5.2% in 2008 in the second half of 2008 it was seen a significant slowdown in economic growth (GDP in 2009 increased by about 1.8 The years 2010 - 2014 was a period of many changes in GDP growth because, while in 2011 was an increase of 4.5%, already in 2013 - a decrease of 1.6% (Table 2). In turn, Table 3 presents the percentage changes of selected variables - current year to the previous year (R1-R0) / R0).

Table 3 Percentage changes of selected variables in Poland (change year to year)

Year	*Public finances revenue_ real*	*Public finances expenditure _real*	*GG debt_ real*	*GG deficit_real*
2001	1,71	6,61	1,35	59,34
2002	2,63	4,50	14,14	3,32
2003	4,09	3,18	15,40	29,79
2004	4,46	2,59	2,90	-10,17
2005	8,25	4,04	7,19	-19,52
2006	8,87	6,37	8,16	-3,62
2007	12,51	6,50	1,93	-43,93
2008	1,96	6,41	8,95	102,50
2009	1,27	6,41	10,10	107,71
2010	-0,49	5,04	10,72	7,33
2011	5,15	-0,43	5,99	-33,42
2012	3,89	0,67	-0,54	-23,52
2013	-1,03	0,51	4,47	9,43
2014	4,13	2,53	-6,44	-17,22

The variables presented in the table are in real terms by the CPI (I_1= 2000 = 100). Analyzing the results in Table 3, we note that in 2007, in Poland has performed a significant increase (change of 12.51%) of government revenues (compared to 2006), the increase in spending of public finances (change of 6.5%), and slight decline in public debt and a significant decrease in the deficit of General Government (change of -43.93%), with sustained high economic growth of 6.8% of GDP. During the crisis, there was a slight increase in government revenues (1.96%) in 2008 compared to 2007, the increase in spending of public finances (change of 6.41%), the increase in public debt (change of 8.95%) and a significant increase in the GG deficit (change of 102.5%), with slightly lower, but still high GDP growth rate (5.1%). In turn, the year 2009 was characterized by low economic growth of 1.6% of GDP with a much lower gain public revenues (change of 1.27%) compared to 2008., increased spending of public finances (change of 6.41%), a higher deficit (change of 10.10%) and public debt (change of 107.71%) compared to the previous year. However, in 2014 (compared to 2013) observed decrease in the deficit (change of -17.22%) and public debt (change of -6.44%) with an increase in public revenue (change of 4.13%) and growth public expenditure (change of 2.53%). On the other hand, economic growth in 2014 was higher (3.3% GDP) compared to 1.6% of GDP in 2013. It seems that it is difficult to indicate at which point there were strictly Keynesian and non-Keynesian

effects of fiscal tightening in Poland in the period under review. This is partly due to the fluctuations koninkturalnych as gopodarcze slowdown of 2001-2002 and the recent financial crisis, which began in 2008.

3. Conclusions

The considerations discussed in this article focus on the relationship between the deficit and the debt of public finance sector and economic growth in Poland. The deficit and public debt are the key indicator of the direction of fiscal policy in the country. The time of the restrictive fiscal policy necessary to reduce the level of debt was interrupted in 2008 with the arrival of the global financial crisis. As a result, in 2009-2010, many countries applied expansive fiscal stimulus, which had a base in the Keynesian approach to stimulate the economy. In Poland, even before the crisis was limited deficit and public debt, with high economic growth, while during the crisis increased the imbalance of public finance at a lower rate of economic growth. It was only from 2011 began the process of tightening fiscal policy which the effects of improving public finances, with moderate growth (3.3% of GDP), is visible only from 2014. Expansionary fiscal policy often caused by economic fluctuations contributes to the deepening of public finance imbalance with frequent decline in GDP growth. The restrictive policy influences on improving the situation of the public finance sector in the long-term with at least moderate economic growth.

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IMPACT OF CROSS BORDER COOPERATION PROJECTS BETWEEN SLOVAKIA AND HUNGARY IN TERMS OF COHESION POLICY

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Abstract: *Cooperation is the key to a better Europe. European Union supports territorial cooperation between border-regions, especially in the border settlements. Border regions, towns and districts promote cooperation as a tool for growth and change through policy development and strategic orientation within territorial cooperation and beyond regional development. Regional disparities in Slovakia are actually the highest among EU countries and the Cohesion policy tries to balance with European. The aim of the study is to analyze the impact of projects on disparity and economic growth in border areas mainly in the context of Slovak indicators. The comparative study also hypothesis whether the cross-border region in Hungary and Slovakia behave differently in terms of absorption in the 2007-2013 programming period. Finally, it is focusing on future prognosis and possible trend of the current 2014-2020 period.*

Keywords: *Regional Development, Cohesion Policy, Cross Border Cooperation, Disparity, Economic Growth*

1. Introduction

Nowadays, the efficient development of regions is hard to imagine without utilization of opportunities from development funds and EU sources. This is especially typical for settlements in cross-border areas, which are located near to the state's border and relatively far from centralized industry and community centre of a country. It is particularly necessary to use allocation resources of the European Regional Development Fund in order to maximize their impact on achieving the target goals and to approach the EU's average, both in the terms of GDP and unemployment rate. In case of Slovakia and Hungary this resource is the Cross Border Cooperation Programme between Hungary and Slovakia (hereafter as "CBC HU SK')

The research is conducting mainly on testing the hypothesis:"*Realisation of CBC HU SK projects and its absorption positively influences the regional development of Slovakia."*

Finally, the perspectives and the current cross-border cooperation programmes in the period of 2014-2020 will briefly introduced. Special focus is taken on the role of regions in Slovakia in terms of disparities and project absorption where it is also presented whether the numbers and amounts of approved CBC HU SK grants resulting the cohesion of regions in Slovakia.

Methods used: Statistical data analysis, Convergence analysis by disparities, Comparative studies, Absorption Maps of CBC projects, Cohesion analysis of the region.

2. Theoretical background

In search for efficiency, effectiveness and fiscal sustainability of cross border territory projects, NUTS 3 regions gather more performance and information on funding than ever before. As many of them have thought to incorporate and use this kind of information in budgeting of local government and planning cooperation continuously and simultaneously with regards to EU Cohesion Policy.

2.1. Cohesion Policy of the EU

Economic, social and territorial disparities at regional and national level have increased in the enlarged European Union. In order to strengthen economic and social cohesion the Community is aiming at reducing these disparities between the levels of development of various regions and the declining of the least favored regions, including rural areas. Achieving the highest possible efficiency in the use of EU Funds for the development of education and employment in the Slovak border regions is a priority and one of the main objectives of the Commission, national governments and the regions themselves. Role of the European Regional Development Fund in Slovakia is mainly expressed with the main goal of European territorial cooperation. Cohesion Policy is helped by Cohesion Fund which is one of the five European Structural and Investment Funds. From 2014, these operate under a common framework and pursue complementary policy objectives. They are the main sources of investment at EU level to help Member States to restore and increase growth and ensure a job rich recovery while ensuring sustainable development, in line with the Europe 2020 objectives. [1] The number of projects is surprisingly very high in this areas, however according to the public awareness whereas those towns where the Cohesion Policy rule of convergence criteria of GDP< 75 % is already fulfilled. [2] In terms of the number of project we can find that there are higher amount of contracted amount in Southern regions of Slovakia in Operation Programmes. [3] In accordance with the new design of the European Cohesion Policy of 2014-2020 and the targets set in *Europe 2020*, the programs have been

significantly reshaped to achieve greater impact and an even more effective use of investments. These regulations are contributing to the delivery of the *Europe 2020* strategy for smart, sustainable and inclusive growth. [4]

2.2. Cross- border territory and cooperation

"Europe without borders" has been always a slogan strengthening Europe's cohesion. Now and there, it is also disputable if borders still exist. [5] However, some publications from the beginning of millennium defined that Schengen control is looping on importance [6] this can be changed in the future after 2015. According to the research of Van Houtumn [7] the cross-border cooperation is influenced by creation of relations, networking, *interactivity, transaction, success, long-term relation.* Trust is also a key factor as sometimes borders mean border in mind. These borders can be caused for border inhabitants while the other part of the country seems to them far. Trust is a psychological factor, not an economic one, however in final output it can cause lack of *cooperation, interaction and in long-term it can have impact on cross-border cooperation and economic indicators*. On one side borders can protect and filter dangerous threats, on the other side they can positively effects economy, interaction helps to join, organize groups of people together, even if they come from different cultural background. [8] The economic powers would like to make the borders without barriers, on the contrary political powers do not prefer this way. [9] Studies about the Hungarian- Slovak cooperation possibilities are expressing that the cross-border regions often belong to the most neglected and less developed places in Europe. This can be explained partially by the long- term pressure between nations due to history and sometimes also by wars. [10] Regional development in Hungarian and Slovak cross-border territory has been always the place, where authorities neglected infrastructure, starting from the socialist era. [11] However, its agricultural potential is competitive advantage [12] as the agricultural indicators are favourable.

3. Research

In this study we concentrate for regions of NUTS 3 (county) level and we might find some regions behave homogenous we in terms of absorption CBC HUSK and economic growth.

The aim is to search for dependency (correlation) between the below mentioned economic indicators, number of projects and locations, where the funding of CBC HU SK goes. First, a situational analysis based on economic indicators as GDP and unemployment rate in both of the countries in order to examine their impact and compare with the trends in CBC project.

3.1. Regional disparities in economy

In general, we can measure the growth of regional development with following indicators; however there are almost 3600 other indicators in the EU legislative [13]. Measuring economic growth is a complex activity, comparing two countries is specific; especially border regions are subjects of macroeconomic comparisons with hard units to divide and compare with. We selected NUTS 3 in Slovakia to measure the impact of projects in cross border areas of Slovakia. In Figure 1 the graph describes that Slovakia (dark blue line) has been always higher with the rates of unemployment as Hungary the light blue line.

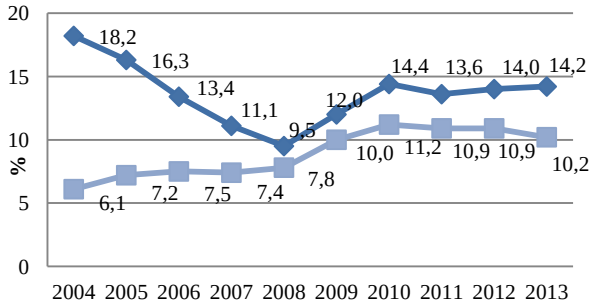

Figure 1 Comparison of Slovakia and Hungary in terms of unemployment rate
Source: own preparation according to www.ksh.hu and www.statistics.sk

This section analyzes also the main indicators of macroeconomic values with Gross Domestic Product (GDP hereafter), however on NUTS 3 level their validity is questionable. From statistical analysis we observe that unemployment rate was behaving differently in Hungary (growing up to 2010) as in Slovakia (decreasing before 2008 and growing after 2008 up to 2010) with a very relevant difference, but nowadays it is competitive.

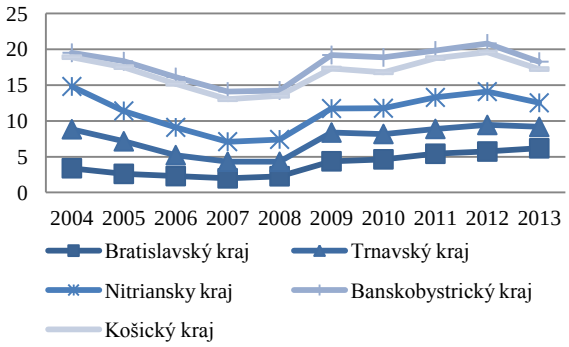

Figure 2 Trends of unemployment rate 2004-2014
Source: own preparation according to www.statistics.sk

The Slovak Labor market shows the lowest numbers in the capital, the best result from other border regions has Trnava and Nitra region, geographically they are in Western part of the country which explains the presence of capital and Vienna-Bratislava-Budapest triangle, as well. With regard to the last 10 years of GDP amounts the comparison shows rapidly growing Slovak economy, but still very rough differences in regions between periphery and capita are appearing, almost the double rate of GDP still present.

Figure 3 describes Bratislava as the fastest growing region and from border regions the second best is Trnava, but

surprisingly not just Nitra follows. Here we find relevant importance of Košice city agglomeration, too.
Summarizing the indicators of GDP and unemployment rate at border regions have not changed significantly comparing to Bratislava region. This can also be explained by the long-term effect of economic processes.

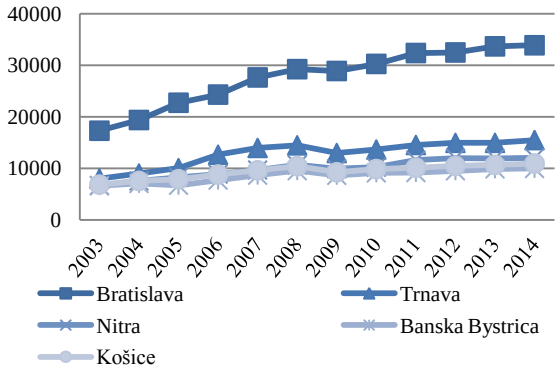

Figure 3 Trends of GDP level in selected Slovak cross-border NUTS 3 regions
Source: own preparation according www.statistics.sk

3.2. Trends in Cross Border Cooperation

Development of cross-border activities is defined by primarily encouraging entrepreneurship, in particular the economic development, tourism and also border-road and -bridge construction, culture, health cooperation and cross-border trade cooperation. In those 5 calls of Hungary-Slovakia Cross Border Programme 2007-2013 there were more than 300 joint cross-border projects accepted and the majority contracted [14] and implemented. In above mentioned projects there were involved more than 400 project partners from Slovakia [15 – p. 105].

Table 1 Absorption of CBC HU SK projects in eligible NUTS 3 counties

County	*Contracted amount in EUR (according to the seat of lead partners)*	*Contracted sum in EUR (detailed data for project partners)*	*Inhabitants*	*Sum per capita in EUR*
Bratislava	8 223 653	9 325 181	485 469	23
Trnava	9 149 633	12 240 882	403 356	109
Nitra	22 133 406	21 884 765	647 061	196
Banská Bystrica	19 366 908	16 343 568	583 521	238
Košice	29 096 707	34 158 075	771 186	279
SUM SK eligible area	87 970 308	93 952 471	2 890 593	

Source: own processing based on IMIS (monitoring system for HU-SK CBC Programme 2007-2013)

The subject of the research selected direct border regions to analyze with the suggestion that their relevance will be higher, above there is a NUTS 4 map of regions which suggest the highest rate of absorption in the agglomeration of the capital Bratislava and Košice city.

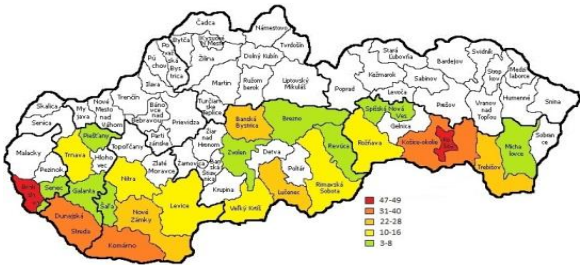

Figure 4 Absorption map describing number of supported projects per districts NUTS 4 in HU-SK 2007-201
Source: Hakszer: Cross-border cooperation programmes and regional inequalities in South Slovakian cross-border regions. Dissertation thesis

However, Košice and Bratislava as two major cities possess with agglomerations (marked as red in Figure 4) and they are absorbing in general a lot of funds, also because of the seats of many (primary all of governmental) organisation is centralized here. According to the analysis we can see the dependence of the size of the town or city, which is indicated by red logically the number is high.
The correlation analysis will be testing whether there is an existing relation between the economic indicators and regions of projects. The direct cross-border districts (NUTS 4 level regions) are 12 in Southern Slovakia in this case (in SK-HU border area). The figure 5 shows contracted amounts in EUR in HU-SK 2007-2013 CBC programme for each direct border district. Trendline is very flat (R^2 is only 0,0026), but we can find, that the western and eastern districts are strong, in contrary with middle part (see districts of Veľký Krtíš, Rimavská Sobota and Revúca), where is very low number of projects (see also [15]) and contracted amount.

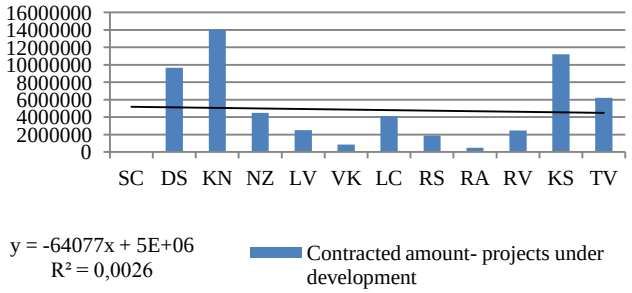

Figure 5 Linear regression of absorption level (in EUR) of funds of HU-SK CBC Programme 2007-2013 in Slovak direct cross-border districts
Source: own preparation

(Abbreviations : SC-Senec, DS-Dunajská Streda, KN-Komárno, NZ-Nové Zámky, LV-Levice, VK-Veľký Krtíš, LC-Lučenec, RS-Rimavská Sobota, RA-Revúca, RV-Rožňava, KS-Košice-surroundings, TV-Trebišov)

The calculation per capita is more precise: the second trend line (Figure 6) shows that contracted amounts in districts per inhabitants living in district and gives a R=-0,353 value, in favor of Eastern Slovakia: which counts that in Eastern Slovakia there were contracted in average much bigger amounts per projects in comparison with western part of border area.

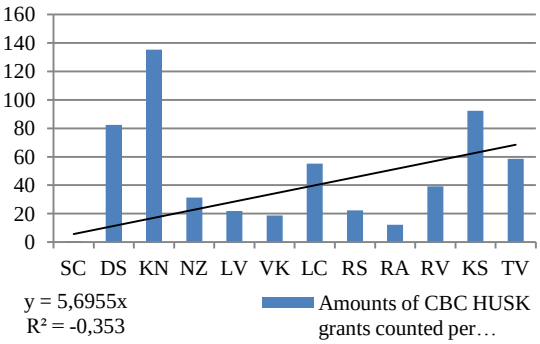

Figure 6 Linear regression of absorption level per capita (in EUR) in direct Slovak cross-border districts
Source: own preparation

Finally, the goal is to reach supporting links between urban and rural areas and by establishment and development of cross-border co-operation, primarily on the following priority areas as innovation, environment, accessibility, sustainable urban development.
However, the trend of absorption is rather characteristic of behavior so basically a qualitative indicator, it can be deducted by the most common topics and popular success stories, or sustainable development and long-term project possibility.
Looking at the priorities of the calls in Cross-border Cooperation programme Hungary-Slovakia 2007-2013 was focused primary on *"Economy and society"* and it is planned to aim at actually promoting cooperation initiatives contributing to an integrated development these areas. Second major priority in this programming period was aiming to *support environment, nature protection* and accessibility incorporates interventions aimed at improving the physical conditions of cross-border co-operation, primarily in the fields of transport and communication, as well as interventions to improve the natural environment.[16] Taking into consideration applicant's legal status this calls are not specifically designed for SMEs. There is a new legal status from 2008 the European Grouping of Territorial Cooperation. [17]
Every country is economically and regionally diverse and unique in Central Europe; also the employment rate differs even if they are neighboring, so absorption rate is usually higher in those which are less developed. [18]

4. Impacts of CBC HU SK Projects and Discussion

The subject of this part is to summarize the previous facts about macroeconomic measures, correlation and convergence and analyse contracted project numbers, success rate, density and appearance and type of project.
Measuring convergence between regions where projects were realised: We found out that the correlation in the western and eastern part of Slovakia is higher in terms of CBC HU SK.
Measuring with success ratio of project by number of requested and approved projects divided, in percentages: Here we found the number of highest amount was Trnava and Nitra county with the districts of Dunajská Streda and Komárno.
The support under INTERREG V-A Slovakia-Hungary 2014-2020 CBC Programme will be directed towards the protection and improvement of the environment, building transport infrastructure (i.e. cross-border roads and bridges), strengthening of cross-border mobility, use of the river for freight and passenger transport and the construction of modern transport network of border regions. There is growing need of regional development, creation of jobs, workmarket, information people to people cooperation across borders and infrastructure. [19]
Generally, the impact cross border territory might be the highest, as geographically those regions are the furthest located from the capitals as Bratislava, Budapest. [20]
The new trends of 2014-2020 in the programming periods according to Strategic Framework of supports the fields such as environmental innovation, infrastructure, economic growth, development of human capital, sustainable and effective usage of nature sources, modern and professional public administration. [21]
Although, it seems that available performance information is incorporated fairly well, measurement and effective usage as well as sustainable development and continuity are sometimes missing in long term plans. Considering the existing social and economic relationships of Southern Slovakia the key to the social and economic renewal of the subject region are the small- and middle enterprises. [22]
Regional development, project evaluation activities along with the objectives and activities, priorities and programs of CBC HU-SK could be more effective in the next or current period. There is a future expectation that Hungarian-Slovak Border Strategy will be reducing isolation and expanding synergy through improved information change between actors, access to cross-border transport and communication networks and service by cycle-path and other infrastructural road enhances cooperation of various offices, public institution environmental, nature protection, promoting sustainable and quality employment. [23]

5. Conclusions

Summing up, the main goal of this article was to discover how the cross border projects correlate to the regional growth of Slovakia.
We can partially reject the hypothesis according to which the CBC HU SK specifically creates economic and regional growth for Slovakia. Statistically, this cannot be observed, yet. This does not mean that the programme is not useful, just the opposite, it creates added value in networking, international cooperation and common use of the tools of EU.

In order to analyse the effectiveness of projects it is important to see the previous and current status, also analyse the economic indicators long-term. The numbers of projects in programming period 2007-2013 - in comparison with previous programmes - was relatively high and also amount of approved support, but it will be taken into the consideration that, the overall allocation for CBC HU SK programmes (and generally for all CBC programmes) is very small in comparison with available sources for "national programmes" founded by EU.[24]

It can be concluded that measuring the effectiveness of economic indicators remains sometimes just an objective evaluation given that the macroeconomic indicators does not show any relevant grow, yet. However, budgeting in new period of 2014-2020 for regions offers interesting insights in the way this kind of distribution of allocation is practiced in EU funds located in cross border regions. Regions of Northern Hungary and South Slovakia are very different as it was showed in cohesion policy analysis they differ within countries (Bratislava, Komárno), both the priorities and stages of development are facing new development.

Changes in priorities for 2014-2020 as Integrated Territorial Cooperation will be more effective and he cross-border programs with improvement of concentration principle (reduction of number of priorities) and with respect to the creation of synergy or strengthening of a tangible result are places of social innovation, networking and soft development. [25] They should show a best practice for central regions as Bratislava and Budapest and prove that peripheries can also be successful by developing collaboration, capacity building and joint use of infrastructure as the common cycle roads. This can be achieved by planning common projects in economic development the best practice remains in sharing in particular in sectors such *as traffic, events, health, culture, tourism and education.*

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VERIFICATION OF THE THEORY OF PERMANENT INCOME IN CZECH REPUBLIC AND DISTRIBUTION OF TOTAL SAVINGS OF CZECH HOUSEHOLDS

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Abstract: *The paper deals with the verification of the theory of permanent income in the Czech Republic during the recession, and this work also deals with the distribution of savings of Czech households in individual instruments. The aim of this paper is to confirm or disprove the hypothesis that during the recession Czech households withdraw savings to cover the loss or reduction of their íncome. Another hypothesis, which is discussed in this paper, is the correlation between the development of overnight deposits of households and GDP development. This hypothesis was disproved by means of Pearson correlation in this paper, it was found that these two variables do not correlate directly. The final goal of this paper is to split the total savings of Czech households into individual instruments.*

Keywords: *overnight deposits, correlation, savings, income, GDP development*

1. Introduction

Permanent income can be defined as income that is more or less constant and is consumed at the time. From this income a stable consumption is derived. This paper deals with the confirmation of this theory in the Czech Republic for the medium-term period 2008-2013, with emphasis on the years 2009, 2012 and 2013, when the Czech economy was in recession. The paper should answer the basic question of whether households behave according to this theory, or conversely generate more savings because of future economic uncertainty. In particular short-term savings (overnight deposits), which are characterized as very liquid, and if necessary they can be immediately withdrawn, are solved.

This paper aims to prove or disprove the following hypotheses:

1. During the recession of the Czech economy household withdraw savings to cover the loss or reduction of their income.
2. There is no direct correlation between the development of overnight deposits of households and GDP development.

Another aim of the article is to determine overall savings of Czech households in the individual instruments.

2. Permanent income theory

This theory was first formulated in 1957 by economist Milton Friedman, who split income into two components: permanent income, which is income that households expect in the course of their economic life, and then temporary (transient) income, which deviates from the permanent [1]. This includes mainly disposable income (inheritance, insurance payment, etc.). Households use savings and borrowings to smooth out their consumption as a result of temporary changes in their income. Permanent income theory says that in the latter stages of the economic life the household consumes resources (assets) generated in the active economic life.

3. Development of short-term household savings in the Czech Republic for the period 2008-2013

In this section the development of short-term household savings (overnight deposits) for that period is analyzed, which was chosen because it captures the beginning and end of recession in the Czech Republic. Also because it is medium-term, so there is a higher predictive value of conclusions.

On this development of short-term household savings the hypothesis that households behave according to the theory of permanent income, i.e. during the recession consume their savings, is confirmed or disproved. In Table 1. steady growth in overnight deposits by households for all quarters of the selected period 2008-2013 is noticeable.

Table 1 Development of overnight deposits of households for 2008-2013 in quarters, in billions of crowns [2]

Year	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*
2008	1 236,2	1 269,6	1 298,1	1 309,3
2009	1 332,8	1 369,4	1 370,9	1 418,3
2010	1 452,3	1 546,3	1 626,1	1 664,2
2011	1 665,9	1 679,5	1 694,5	1 723,1
2012	1 783,8	1 988,0	2 037,1	2 050,1
2013	2 050,3	2 050,6	2 051,0	2 051,2

Table 2 GDP development in the Czech Republic, 2008-2013 [3]

Year	*GDP development in %*
2008	3,1
2009	-4,5
2010	2,5
2011	1,8
2012	-1,0
2013	-0,9

Table 3 GDP development in the Czech Republic and the annual change in the volume of overnight deposits of households [3]

Year	*GDP/decrease in %*	*Annual change of in deposits in %*
2009	-4,5	8,3
2012	-1,0	10,4
2013	-0,9	7,8

The table 3 shows that in that period, when the economy was in recession, households increased volumes of overnight deposits annually, which disproves the theory of permanent income, which states that at a time of recession, households consume their savings because their incomes are reduced. In 2009, the Czech economy was in the deepest recession since 1997, and yet year households were able to increase the volume of short-term savings of 8,32 % annually, which corresponds to an absolute 109 billion crowns. Annual increase was also recorded for the years 2012 and 2013.

4. Determining of correlation between quantitative variables of GDP and overnight deposits between 2008-2013 in the Czech Republic

This chapter deals with correlation analysis. The correlation analysis has the following parameters:

- It is the Pearson correlation.
- Correlation analysis assumes the probability level of 95 %, which is considered as adequate in economy.
- The number of parameters: 5.

Table 4 Yearly change of overnight deposits of households in % [2]

Year	*Change in overnight deposits of households in %*
2009	8,32
2010	17,32
2011	3,54
2012	10,39
2013	7,77

From the data in Tables 2 and 4 the Pearson correlation in Excel program (which has functions of statistics) was calculated, and the correlation came out 0,878, indicating that there is a linear (straight) relationship between GDP development and annual change in overnight deposits by households. The calculated figure 0,878, however indicates the existence of indirect correlation relationship between these two variables.

This is the Pearson correlation, which reflects the linear relationship between the quantities. In this case, they are quarterly changes in the volume of overnight deposits of households and quarterly changes in GDP development. Both quantities are in annual comparison for the relevant period 2008-2013.

From Table 5 is indicated that deepest crisis was in 2009, when GDP declined throughout all four quarters. In the second quarter of 2009 the annual decline of GDP was almost 5 %, which is a very big decline. In the years 2010-2011, there was a growth of GDP, but in 2012-2013 the annual GDP fell down again.

Table 5 Quarterly GDP development in 2008-2013 annually in % [4]

Year	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*
2008	5,3	4,6	4,7	0,7
2009	-4,0	-4,9	-4,4	-3,2
2010	1,2	2,3	2,8	2,6
2011	2,8	2,2	1,2	0,6
2012	-0,7	-1,0	-1,5	-1,7
2013	-1,9	-1,2	-1,6	0,8

From Table 6 implies the annual growth of overnight deposits of households on a quarterly periods in each reference year. In annual comparison in the second, third and fourth quarter of 2013 the lowest creation of overnight deposits of households was recorded, which grew in this period by an average of 0,04 %. The highest annual increase of overnight deposits of households was in the first quarter of 2008, the third quarter 2010 and third quarter of 2012, when it grew annually by 20 %.

Table 6 Quarterly developments of overnight deposits in 2008-2013 annually in % [2]

Year	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*
2008	19,41	14,46	14,42	8,81
2009	7,81	7,47	6,30	8,32
2010	8,97	13,33	17,84	17,33
2011	14,71	8,61	4,21	3,54
2012	7,01	18,37	20,22	18,98
2013	14,95	3,15	0,68	0,54

Based on the data in Tables 5 and 6 the Pearson correlation was calculated in the program excel, which provides statistical functions and correlation equaled 0,942, which means that there is no linear (straight) relationship between these two variables.

5. Allocation of savings of Czech households

The chapter addresses in detail the allocation of household savings in the Czech Republic with an emphasis on instruments/institutions where they are deposited. Czech households make savings primarily from precautionary reasons (to cover adverse life situations), but also to cover future expenses associated with the period when they will not be economically active. It is mainly for retirement.

Table 7 Status and distribution of savings in 2014, in billions of crowns [5] [6] [7]

Investment instrument	*Value*
Bank deposits	2 000
Deposit in building savings	450
Life Insurance	350
Mutual funds	350
Pension funds	450
Total	3 600

The table 7 shows that the largest part of the savings in the Czech Republic is stored in bank deposits (term, demand deposits). So in deposits, where deposit insurance up to a certain amount by the Deposit Insurance Fund is guaranteed. Deposits in building savings are thanks to

government support also very popular way to store savings. The volume of these instruments makes up to 68 % of total savings, thus represent a significant role. The reason for this distribution of savings is likely guarantee of return, safety and state allowance for building savings. Life insurance functions primarily as a mean of securing in case of negative life events aimed at disbursement. Life insurance apart from the insurance component includes an investment (or equity) component, where means get evaluated based to the development of the underlying asset, which could be any asset. Mutual funds are more risky, and therefore the volume of savings in them is relatively small, since it is non-guaranteed investment, which is influenced by many technical and fundamental parameters of the capital market. Pension funds represent in this case so called transformed funds offering guaranteed, non-negative evaluation and allow tax deductions. These funds can no longer be entered, so the premise for the future is that the volume of resources in these funds will decline because of client's withdrawals.

5. Conclusions

The aim of the article was to confirm or disprove the following hypotheses:

1. During the recession of the Czech economy households withdraw savings to cover the loss or reduction of their income.
2. There is no direct correlation between the development of overnight deposits of households and GDP development.

Another aim of the paper was to determine the distribution of total savings of Czech households in individual instruments.

The first hypothesis is refuted by analysis of the volume of overnight deposits of households during the periods of recession, when households in the recession conversely generate much higher volumes of deposits, probably because of adverse future economic expectations (negative sentiment of Czech households).

The second hypothesis is confirmed by the correlation calculation, the result was clear, that there is no direct correlation between these two variables. However, the calculation showed an indirect relationship.

Another aim, namely the distribution of total household savings have been accomplished.

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ANALYSIS OF THE ENERGY SECTOR IN POLAND ON THE EXAMPLE OF ENERGY INDUSTRY COMPANIES QUOTED ON THE STOCK EXCHANGE

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Abstract: *This paper examines share price of the companies listed on the WIG-ENERGIA and their fair value between 2010-2016. Data from 2010 to 2016 were collected from the Stooq.pl (Polish portal of shares). Two hypotheses are tested: (1) value of the shares based on the market price; (2) value of the shares as the fair value of shares. The energy market was analysed and characterised, also the companies participating in it were described. Nevertheless, the market value of shares does not reflect the fair value of the shares which is currently assigned to different companies in the sector. The research analysed the key financial ratios, the actual value of shares; also the fair value of the energy sector companies listed on the Warsaw Stock Exchange was calculated.*

Keywords: *power engineering, fair value of shares, company, market value of shares.*

1. Introduction

The energy security is a strategic issue for every country. For every country, the generation and transmission of electricity is the economic lifeblood, which in addition to the transport system, determines efficient functioning of the economy, and even makes a country independent from other countries and economies.

The economic development of the country is dependent on the access to energy. It is predicted that until 2040, the global economy will be growing at an average rate of 2.8% per year. Taking into account the predicted steady increase of efficiency in the energy production, the increase of the global energy sector will be 1.1% per year. It is anticipated that the importance of conventional sources (energy from coal and oil – the expected increase of 0.4% per year) will be decreasing, with the concurrent increase of participation of the renewable sources (solar, wind and geothermal energy – the increase of 7.4% per year). The development of the renewable energy should contribute to the achievement of its share of approx. 20% in the energy production in 2040.

2. Fair value of listed companies

Share price of the companies listed on the Stock Exchange should reflect also their fair value. The fair value can be defined in several ways. In view of the foregoing, the fair value is a value used repeatedly in accounting, and thus in Article 28 (6) of the Accounting Act of 29.09.1994 as "the amount for which a given asset component could be exchanged, and the liability could be paid on market transaction terms between interested and well-informed, unrelated parties.

In view of whether the price of shares that are quoted on the stock exchange corresponds to their fair value, should be found in the value alone, since, after all, the values may be diverse, like the value of a similar company, producing similar goods and operating in the same industry, will also be diverse for various reasons.

The subject of trade covers minority shares, and the main market participants are retail investors or minority institutional investors, thus the price of shares should reflect the fair value characterizing the liquid minority interest.

The value presented in this way seems righteous, which is confirmed by the premium paid by the investors who announce calls for subscription for shares and plan in this way the purchase of the controlling interest. Then the premium reflects the difference between the level of liquid minority interest and the level of controlling interest. Sometimes the level takes into account benefits resulting from synergy. An investor purchasing the controlling interest in this way receives premiums that appear after taking over control of a company, in the form of funds, business management and making a number of strategic decisions.

The fair value of the share price should be determined in accordance with the idea of capital market, namely the market participants should have equal access to data, information and all messages concerning a given company [10, 11]. However, the investors are divided into three groups:

a) People with access to the most closely guarded information that affects the price and the business value, namely those can the company's management board or shareholders,
b) Institutional investors with blocks of shares with simultaneous access to the company's management board,
c) Individual investors who have access to public information.

There is one premise more to determine the fair value of share price. The investors are fond of investing in shares, namely they buy them as in the past they managed to earn on them and they feel that presently the share price is ideal and reflects their fair value and will enable them to obtain fair dividend in the future [1, 3].

Such a purchase or sale of shares can largely overestimate or underestimate the share value of a quoted company. Here the chemical industry may serve as an example, namely shares in chemical companies at the beginning of the new millennium, when shares in these companies were being purchased without any analysis in technical terms, but looking at their name and value, which was increasing overnight. In view of the foregoing, this led to excessively high business value above its fair value.
The share price should thus reflect the fair value of a company listed on the Warsaw Stock Exchange. For the value of these companies be fair, the market must make available to all investors information regarding companies listed on the Warsaw Stock Exchange. The shareholders should be treated equally; therefore we cannot distinguish majority shareholders as those who should have information unavailable for minority shareholders. First of all, shares should be liquid securities, therefore they should be in free float and have real-time transferability, namely at any moment and at any time during the office hours of the Warsaw Stock Exchange on a business day.

3. The development of the energy market in Poland

The WIG-ENERGIA index, presented in Figure 1, shows that from 2011 to 03.2016, the energy sector companies in Poland showed a lateral trend in their values.

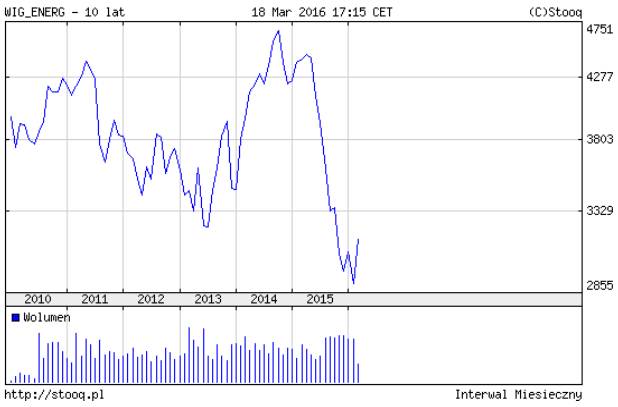

Figure 1: WIG-ENERGY in the period from 01.2010 to 03.2016 [12].

However, from the first quarter of 2016, a significant upward trend as well as the achievement of the highest levels, up to the level of 3121 points in the index. The values reported on 18.03.2016 reflect the upward trend and confirm it. However, the market values do not reflect the fair value of the energy sector companies.

4. Analysis and valuation of the energy sector's companies quoted on the Warsaw Stock Exchange (WSE) in Poland

In the energy sector, it is possible to record one company, the value of which approached to its next to the maximum price on 18.03.2016, and this is TAURONPE. The remaining companies did not have its maximum or even fair value, though they can show the net profit and good financial condition, and it is INTERAOLT. Some companies were overvalued by even 75%. These companies are ZEPAK, CEZ, PEP and ENEA. However, the flagship companies, such as ENERGA and KOGENERA, stay ahead (Table 1-2).

Table 1 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Average rating*	*rating*
CEZ	3.5/5.0	BBB-
ENEA	3.5/5.0	AA+
ENERGA	4.0/5.0	BBB
INTERAOLT	4.0/5.0	AA
KOGENERA	4.0/5.0	BBB+
PEP	4.0/5.0	BB-
PGE	3.5/5.0	BBB-
TAURONPE	3.5/5.0	CCC
ZEPAK	4.0/5.0	BB

Table 2 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Current price PLN*	*Maximum price PLN from the beginning of the stock exchange quotation*
CEZ	65.60	134.5
ENEA	12.22	20.78
ENERGA	12.22	23.58
INTERAOLT	18.75	24.31
KOGENERA	75.00	101.60
PEP	21.00	40.66
PGE	14.26	20.94
TAURONPE	3.03	5.44
ZEPAK	7.44	29.03

Table 3-4 presents the key ratios that show the financial condition of the energy sector's companies. Within the nine examined companies, the generated profit per share was reported in 8 companies. It shows that the energy companies prosper properly on the financial market and are able to record higher or lower profits. However, the profit was not reported in one companies, and he was TAURONPE.
The price to the operating earnings shows the losses of the company at the negative, and this state of affairs was reported in two stock exchange quoted company, and they were PGE and TAURONPE. CEZ and PEP generated a positive ratio, and the other companies, KOGENERA, ENEA, and ENERGA generated a positive one-digit ratio but it is a satisfactory result [6].
In contrast, analysing P/BV and P/P, it should be noted that both the price to the book value and the price to profit demonstrate that three companies operate exemplary on the market and have a value of about 1.0, and these are: INTERAOLT, CEZ and KOGENERA [4, 5, 7].
Other companies do not significantly differ from the average values, and these are ZEPAK, ENERGA.

Table 3 Technical evaluation of the Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the financial data of the of the Warsaw Stock Exchange)

Name	*P/OE (price/ operating earnings)*	*P/BV (price/ book value)*
CEZ	7.72	0.82
ENEA	4.31	0.42
ENERGA	3.95	0.57
INTERAOLT	5.25	3.52
KOGENERA	6.61	0.82
PEP	7.19	0.68
PGE	-7.43	0.66
TAURONPE	-2.79	0.33
ZEPAK	4.61	0.10

Table 4 Technical evaluation of the Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the Warsaw Stock Exchange)

Name	*P/P (price/ profit)*	*Profit per share*
CEZ	1.09	(CZK) 7.578
ENEA	0.55	0.952
ENERGA	0.27	0.328
INTERAOLT	0.48	0.266
KOGENERA	1.15	3.349
PEP	0.34	0.368
PGE	0.93	0.532
TAURONPE	0.29	-1.646
ZEPAK	0.13	0.120

Table 5-6 presents the studies concerning, among others, the net profit, depreciation, EBITDA and assets of the telecommunication sector's companies [8, 9].
According to the obtained values, it is clear that only TAURONPE showed a loss, which was confirmed by the previous ratios included in Table 2.

Table 5 Technical evaluation of the Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the Warsaw Stock Exchange)

Name	*Net profit (net loss) in thousands PLN*	*Depreciation in thousands PLN*
CEZ	(CZK) 4077000	(CZK) 8008000
ENEA	420179	188337
ENERGA	136004	237808
INTERAOLT	5325	619
KOGENERA	49907	33665
PEP	16721	21615
PGE	994000	741000
TAURONPE	-2883958	517983
ZEPAK	6076	90921

Other companies have shown a substantial profit which was generated in 2015.

Table 6 Technical evaluation of the Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the companies quoted on the Warsaw Stock Exchange in Poland)

Name	*EBITDA in thousands PLN*	*Assets in thousands PLN*
CEZ	(CZK) 12346000	(CZK) 602686000
ENEA	711101	21462175
ENERGA	481011	18456000
INTERAOLT	7083	67685
KOGENERA	99895	2256509
PEP	52594	3014486
PGE	2014000	61296000
TAURONPE	-2915418	32071433
ZEPAK	111119	6820538

According to the book value per share, it is possible to deduce that some companies are overvalued, and these are ENEA, ENERGA, KOGENERA, PEP, PGE and ZEPAK, and in the case of the INTERAOLT company, undervalued (Table 7).

Table 7 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*Book value per share in PLN*
CEZ	(CZK) 497.952
ENEA	28.650
ENERGA	21.180
INTERAOLT	1.250
KOGENERA	91.739
PEP	30.567
PGE	21.565
TAURONPE	9.140
ZEPAK	74.431

However, it is important not to follow this opinion because the values are only the book values, and the calculation of them is purely mathematical and financial.
In the case of using the economic attitude and interpretation, it would occur that the companies do not have the fair value [2, 11].
The profitability of the equity as well as the profitability of assets is shown only by CEZ, ENEA, ENERGA, INTERAOLT, KOGENERA, PGE, ZEPAK however, PEP and TAURONPE do not have it.
Therefore, according to the presented study, it is possible to observe that the flagship energy concerns have the profitability and they are not threatened by any disturbance of the financial liquidity (Table 8).

Table 8 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*ROE*	*ROA*
CEZ	10.17	3.85
ENEA	7.77	6.83
ENERGA	10.54	5.49
INTERAOLT	42.47	14.55
KOGENERA	15.46	11.07
PEP	-2.56	-1.72
PGE	17.35	15.92
TAURONPE	-18.75	-12.16
ZEPAK	8.56	6.96

Currently, the value of companies significantly deviates from the maximum value achieved a few years ago. The only one exception is INTERAOLT, which achieved the maximum value in its history. Other companies have the value less than 50%, and even 75% of the maximum one (Table 9).

Table 9 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Current value*	*Maximum value*
CEZ	65.60	134.5
ENEA	12.22	20.78
ENERGA	12.22	23.58
INTERAOLT	18.75	24.31
KOGENERA	75.00	101.60
PEP	21.00	40.66
PGE	14.26	20.94
TAURONPE	3.03	5.44
ZEPAK	7.44	29.03

However, the fair value which should be reflected by the share prices of the examined companies significantly differs from the calculated value, which was presented in Table 10. In some cases, it is even 25% of the current value. The fair value is considerable higher than the current value of the examined companies, and only similar in one company, ZEPAK.

Table 10 The Energy sector's companies quoted on the Warsaw Stock Exchange in Poland as of 09.03.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*Fair value*	*Deviation from the fair value in PLN*
CEZ	88.25	46.25
ENEA	20.00	7.78
ENERGA	21.00	8.78
INTERAOLT	22.00	3.25
KOGENERA	95.52	20.52
PEP	35.00	14.00
PGE	18.55	4.29
TAURONPE	4.50	1.47
ZEPAK	17.64	10.20

5. Conclusion

The share price of the energy sector companies quoted on the Warsaw Stock Exchange in Poland is similar to the fair value because there is a high demand for energy in the world. Though, energy companies demonstrate a profit and the fair value at the same time because the energy market in Poland is developing very well, and even promising bigger development for the future years. In some European Union countries, the development of the energy market is faster because these countries have access, in larger quantities, to the resources, such as oil or natural gas which means that they do not have to import significant amounts outside its borders.

The fair value of all the energy sector companies quoted on the Warsaw Stock Exchange in Poland should be achieved within one year, by 2017, because the energy sector is developing very rapidly.

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VALUATION OF SHARES AND THEIR FAIR VALUR OF THE COMPANIES LISTED ON THE RAW MATERIALS SECTOR QUOTED ON THE WARSAW STOCK EXCHANGE IN POLAND WITHIN 2011-2016 AND THEIR FAIR VALUE

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Abstract: *This paper examines share price of the companies listed on the WIG-SUROWCE and their fair value between 2011-2016. Data from 2011 to 2016 were collected from the Stooq.pl (Polish portal of shares). Two hypotheses are tested: (1) value of the shares based on the market price; (2) value of the shares as the fair value of shares.*

Keywords: *raw materials, fair value of shares, company, market value of shares.*

1. Introduction

The intensive development of the raw materials extraction in Poland has occurred especially since the mid '50s of the last century and has been continuing for the '60s and '70s. Since the '80s, in the case of many raw materials, the limitation of their exploitation, and in some other cases, the abandonment of extraction, have been reported, whether for economic reasons or due to the depletion of resources, and finally because of the environmental or spatial conflict. The economic transformation towards the market system, started in 1989, significantly contributed to these phenomena. Currently, since 2000, the large growth of the raw materials market has taken place [2, 3].

2. Fair value of listed companies

Share price of the companies listed on the Stock Exchange should reflect also their fair value. The fair value can be defined in several ways. In view of the foregoing, the fair value is a value used repeatedly in accounting, and thus in Article 28 (6) of the Accounting Act of 29.09.1994 as "the amount for which a given asset component could be exchanged, and the liability could be paid on market transaction terms between interested and well-informed, unrelated parties.

In view of whether the price of shares that are quoted on the stock exchange corresponds to their fair value, should be found in the value alone, since, after all, the values may be diverse, like the value of a similar company, producing similar goods and operating in the same industry, will also be diverse for various reasons.

The subject of trade covers minority shares, and the main market participants are retail investors or minority institutional investors, thus the price of shares should reflect the fair value characterizing the liquid minority interest.

The value presented in this way seems righteous, which is confirmed by the premium paid by the investors who announce calls for subscription for shares and plan in this way the purchase of the controlling interest. Then the premium reflects the difference between the level of liquid minority interest and the level of controlling interest. Sometimes the level takes into account benefits resulting from synergy. An investor purchasing the controlling interest in this way receives premiums that appear after taking over control of a company, in the form of funds, business management and making a number of strategic decisions.

The fair value of the share price should be determined in accordance with the idea of capital market, namely the market participants should have equal access to data, information and all messages concerning a given company [10, 11]. However, the investors are divided into three groups:

a) People with access to the most closely guarded information that affects the price and the business value, namely those can the company's management board or shareholders,
b) Institutional investors with blocks of shares with simultaneous access to the company's management board,
c) Individual investors who have access to public information.

There is one premise more to determine the fair value of share price. The investors are fond of investing in shares, namely they buy them as in the past they managed to earn on them and they feel that presently the share price is ideal and reflects their fair value and will enable them to obtain fair dividend in the future [1, 3].

Such a purchase or sale of shares can largely overestimate or underestimate the share value of a quoted company. Here the chemical industry may serve as an example, namely shares in chemical companies at the beginning of the new millennium, when shares in these companies were being purchased without any analysis in technical terms, but looking at their name and value, which was increasing overnight. In view of the foregoing, this led to excessively high business value above its fair value.

The share price should thus reflect the fair value of a company listed on the Warsaw Stock Exchange. For the value of these companies be fair, the market must make available to all investors information regarding companies listed on the Warsaw Stock Exchange. The shareholders

should be treated equally; therefore we cannot distinguish majority shareholders as those who should have information unavailable for minority shareholders. First of all, shares should be liquid securities, therefore they should be in free float and have real-time transferability, namely at any moment and at any time during the office hours of the Warsaw Stock Exchange on a business day.

3. The development of the raw materials market in Poland

The WIG-SUROWCE index, presented in Figure 1, shows that from 2011 to 03.2016, the raw materials sector companies in Poland showed a downward trend in their values.

Figure 1: WIG-SUROWCE in the period from 01.2011 to 03.2016 [16].

However, from the first quarter of 2016, a significant upward trend as well as the achievement of the highest levels, up to the level of 2332 points in the index. The values reported on 18.03.2016 reflect the upward trend and confirm it. However, the market values do not reflect the fair value of the raw materials sector companies.

4. Analysis and valuation of the raw materials sector's companies quoted on the Warsaw Stock Exchange (WSE) in Poland

In the raw materials sector, it is possible to record one company, the value of which approached to its next to the maximum price on 18.03.2016, and this is KGHM. The remaining companies did not have its maximum or even fair value, though they can show the net profit and good financial condition, and it is PRAIRIE. Some companies were overvalued by even 90%. These companies are BOGDANKA and JSW. However, the flagship companies, such as KGHM, stay ahead (Table 1-2).

Table 1 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Average rating*	*rating*
BOGDANKA	4.0/5.0	BBB-
JSW	3.5/5.0	D
KGHM	4.0/5.0	BB
PRAIRIE	No data	No data

Table 2 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Current price PLN*	*Maximum price PLN from the beginning of the stock exchange quotation*
BOGDANKA	38.50	124.30
JSW	12.28	124.20
KGHM	76.12	162.50
PRAIRIE	0.51	3.11

Table 3-4 presents the key ratios that show the financial condition of the raw materials sector's companies. Within the nine examined companies, the generated profit per share was reported in 1 companies (BOGDANKA). It shows that the raw materials companies prosper properly on the financial market and are able to record higher or lower profits. However, the profit was not reported in two companies, and he was JSW and KGHM.

The price to the operating earnings shows the losses of the company at the negative, and this state of affairs was reported in two stock exchange quoted company, and they were JSW and KGHM. BOGDANKA generated a positive ratio[6, 10].

Table 3 Technical evaluation of the Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the financial data of the of the Warsaw Stock Exchange)

Name	*P/OE (price/ operating earnings)*	*P/BV (price/ book value)*
BOGDANKA	4.22	0.52
JSW	-0.38	0.36
KGHM	-3.16	0.75
PRAIRIE	No data	No data

In contrast, analysing P/BV and P/P, it should be noted that both the price to the book value and the price to profit demonstrate that three companies operate exemplary on the market and have a value under 1.0, and these are: BOGDANKA, JSW and KGHM [4, 5, 7, 14].

Other companies do not significantly differ from the average values, and it is PRAIRE (No data)

Table 4 Technical evaluation of the Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the Warsaw Stock Exchange)

Name	*P/P (price/ profit)*	*Profit per share*
BOGDANKA	0.71	1.667
JSW	0.21	-21.467

KGHM	0.76	-31.185
PRAIRIE	No data	No data

Table 5-6 presents the studies concerning, among others, the net profit, depreciation, EBITDA and assets of the raw materials sector's companies [8, 9, 12, 13].
According to the obtained values, it is clear that only JSW and KGHM showed a loss, which was confirmed by the previous ratios included in Table 2.

Table 5 Technical evaluation of the Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the Warsaw Stock Exchange)

Name	*Net profit (net loss) in thousands PLN*	*Depreciation in thousands PLN*
BOGDANKA	56696	93109
JSW	-2520500	331600
KGHM	-6237000	469000
PRAIRIE	No data	No data

Other companies have shown a substantial profit which was generated in 2015.

Table 6 Technical evaluation of the Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the financial data of the companies quoted on the Warsaw Stock Exchange in Poland)

Name	*EBITDA in thousands PLN*	*Assets in thousands PLN*
BOGDANKA	166334	4289335
JSW	-2763900	11970900
KGHM	-6724000	36764000
PRAIRIE	No data	18623

Table 7 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*Book value per share in PLN*
BOGDANKA	74.379
JSW	33.699
KGHM	101.055
PRAIRIE	0.119

According to the book value per share, it is possible to deduce that some companies are overvalued, and these are BOGDANKA, JSW and KGHM, and in the case of the PRAIRIE company, undervalued (Table 7).
However, it is important not to follow this opinion because the values are only the book values, and the calculation of them is purely mathematical and financial.
In the case of using the economic attitude and interpretation, it would occur that the companies do not have the fair value [2, 10, 15].

The profitability of the equity as well as the profitability of assets is shown only by BOGDANKA and KGHM however, JSW do not have it.
Therefore, according to the presented study, it is possible to observe that the flagship raw materials concerns have the profitability and they are not threatened by any disturbance of the financial liquidity (Table 8).

Table 8 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 31.12.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*ROE*	*ROA*
BOGDANKA	13.85	8.97
JSW	-14.14	-7.37
KGHM	10.15	7.87
PRAIRIE	No data	No data

Currently, the value of companies significantly deviates from the maximum value achieved a few years ago. The only one exception is KGHM, which achieved the maximum value in its history. Other companies have the value less than 60%, and even 90% of the maximum one (Table 9).

Table 9 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 18.03.2016 (own development based on the data of the Warsaw Stock Exchange)

Name	*Current value*	*Maximum value*
BOGDANKA	38.50	124.30
JSW	12.28	124.20
KGHM	76.12	162.50
PRAIRIE	0.51	3.11

However, the fair value which should be reflected by the share prices of the examined companies significantly differs from the calculated value, which was presented in Table 10.
In some cases, it is even 10% of the current value. The fair value is considerable higher than the current value of the examined companies, and only similar in one company, KGHM [6, 7, 9, 11].

Table 10 The Raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland as of 09.03.2015 (own development based on the data of the Warsaw Stock Exchange)

Name	*Fair value*	*Deviation from the fair value in PLN*
BOGDANKA	110.00	71.50
JSW	50.50	73.70
KGHM	125.00	48.88
PRAIRIE	1.90	1.21

5. Conclusion

The share price of the raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland is significantly underestimated by the current financial

situation in the world, especially at such unstable values of the resources [5, 6, 7, 12]. Raw materials companies should demonstrate the higher value, and at least the fair value because the raw materials market in Poland is developing very well, and even promising bigger development for the future years. In some European Union countries, the development of the raw materials market is slower or completely inactive because the countries do not have access to raw materials and do not extract them or their value is low [2, 4, 13].

Raw materials companies earn money because they largely focus on the sale of raw materials resources which are necessary to feed power plants with hard coal and lignite. The flagship raw materials companies achieve huge profits which was confirmed in the studies of ratios in the last few years and the net profit studies in 2014, and such an example can be KGHM, which achieved a net profit of PLN 2,450,000 thousand.

The fair value of the raw materials sector's companies quoted on the Warsaw Stock Exchange in Poland should be achieved within five years, until 2020, because for this period, the further rapid development of the raw materials sector in Poland should be estimated.

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THE EUROPEAN UNION'S NEW STRATEGY FOR TRADE AND INVESTMENT IN THE LIGHT OF NEGOTIATIONS WITH LATIN AMERICA

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Abstract: *Following the new trade and investment strategy also known as Trade for All, the European Union recently redoubled its efforts to expand trade relations with Latin American countries – particularly, in regards to updating existing trade agreements with Mexico and Chile, and relaunching negotiations with Mercosur. Each agreement has been disclosed to include a full chapter on foreign direct investment, a circumstance that raises the question of dispute settlement as the European Union is currently in the midst of establishing a novel mechanism of investment adjudication: the Investment Court System. Whether this arrangement matches the specifics of investment relations between the European Union and Latin American countries remains to be seen.*

Keywords: *European Union, Latin America, Trade for All, Investment Court System*

1. Introduction

Following the new trade and investment strategy also known as *Trade for All* announced by Trade Commissioner Cecilia Malmström in October 2015, the European Union (EU) recently redoubled its efforts to expand trade relations with Latin American countries. In particular, the European Union plans on updating both – the EU-Mexico and EU-Chile – trade agreements, renewing trade negotiations with Mercosur as well as closing the Political Cooperation and Dialogue Agreement with Cuba [1]. Whereas the Cuban agreement acts only as a rudimentary conduit for more elaborate sectoral negotiations to come in the near future, the deals with Mexico, Chile, and Mercosur aspire to incorporate all the hallmarks of "*new generation*" free trade agreements (FTAs), namely, provisions on trade in services, intellectual property, competition, public procurement, sustainable development, and, most prominently, investment [2].

Each of said agreements has also been disclosed to include a full chapter on investment, a circumstance that raises the question of dispute settlement as the European Union is currently in the midst of establishing a novel mechanism of investment adjudication: the Investment Court System [3]. Whether this arrangement matches the specifics of investment relations between the European Union and Latin American countries remains to be seen. Whilst attempting to answer this highly politicized question directly appears preposterous, approaching it from the side, by comparing and confronting the two regimes along with the legal arguments supporting them, may yield some very feasible and interesting conclusions.

This paper strives to deliver, firstly, a fresh perspective on the European Union's new trade and investment strategy, secondly, a précis on the current status of commercial relations between the European Union and Latin America, and thirdly, an assessment of the marriage between the envisaged Investment Court System and the idiosyncrasies of the Latin American approach to investment protection.

2. The new trade and investment strategy

The European Union's newly unveiled strategy "*Trade for all: Towards a more responsible trade and investment policy*" (TFA) endeavors to cover both trade as well as investment while taking a more responsible approach responding to new economic realities in line with the European Union's foreign policy [4]. TFA is expected to deliver a decisive growth boost to the European Union's economy through new opportunities for employment and enterprise (explicitly including SMEs), the completion of the digital trade agenda, and simplified movement of high-skilled workers – chiefly for the purposes of expanding and accelerating research, innovation and exchange of knowledge [5]. To that effect, the Commission claims having "*developed an ambitious bilateral agenda complementing the EU's engagement at the WTO*" that is striving to reach a two thirds coverage of all EU trade solely by FTAs – up from current one third [6]. Thus, European Union's trade negotiations now comprise not only the top priority partners, such as the United States (Transatlantic Trade and Investment Partnership – TTIP), Japan (free trade agreement) or China (investment treaty), but also the Asia-Pacific region, Africa and Latin America [7]. The TFA concept has been conceived on the basis of three key principles: *effectiveness*, *transparency*, and *values* [8].

2.1 Effectiveness

With regards to effectiveness, the European Union pledges to not only modernize future trade and investment agreements in order to enable the best possible outcomes, but also to ensure their proper implementation and fulfillment. Whereas the modernization aims primarily at realizing the fullest potential of the new policy areas having gained momentum in the last decades (*i. e.*, investment, digital trade, trade in services, etc.), proper

implementation and fulfillment carry the promise of coordinating the advantages of the prospective agreements with existing regulatory safeguards [9]. In practice, as a telling example of these, occasionally conflicting tendencies, serves the determined promotion by the European Union of free cross-border data flows – particularly combining the accomplishment of digital trade agenda with restrictive regulatory measures protecting personal data of consumers and securing their right to privacy. Other prominent policy fields strongly influenced by the effectiveness principle feature mobility and migration (especially in regard to recognition of professional qualifications), regulatory cooperation concerning technical matters (*e. g.*, non-trade barriers), customs, trade in energy and commodities, intellectual property rights, and competition (*i. e.*, implementation and enforcement of anti-dumping and state aid measures) [10].

2.2 Transparency

Equally important to effectiveness, the transparency principle has instituted a slow, yet progressive reduction of the democratic deficit in relation to the trade and investment agreements by way of enhanced involvement of the European Parliament [11]. Furthermore, the commitment to conduct trade and investment negotiations transparently helped bring to light the treaty texts and various related documents in a timely manner as well as invited the civil society and other stakeholders to participate on the creation of the negotiation proposals through public hearings and debates [12]. The Commission considers comparably crucial also the impact assessment aspect of transparency, which is to predict the effects of the envisaged agreements on important issues such as sustainable development, human rights, human health and environment protection [13].

2.3 Values

The value orientation of trade and investment ought to preserve, on one hand, consumer protection, including consumer information and maintenance of high product and service regulation standards as well as, on the other hand, represent a firm commitment to promoting human rights, good governance, fair and ethical trading and investment schemes along with fight against corruption at all levels [14]. Moreover, this principle aims to uphold high social and environmental protection standards, and facilitate social justice and sustainable development [15]. Whist the intentions behind this particular resolution may appear honest and noble in their entirety, it seems quite unclear how the European Union wishes to combine the maintenance of high regulatory standards with the principle of mutual recognition that ordinarily permeates these types of agreements.

2.4 Interim outcome: a proposal to establish the Investment Court System

The controversial TTIP negotiations between the representatives of the European Union and United States concerning the investment portion of the agreement, most particularly the investor-state dispute settlement, prompted a broad public debate in respect to legitimacy, necessity and pitfalls of the ISDS mechanism [16]. While the European Union has already been aware of increasing dissent to such provisions, and prepared ahead to face the discord by introducing safeguards to prevent frivolous investor lawsuits against member states and/or the European Union itself, the subsequent backlash against TTIP rendered those efforts fruitless. At this point, it became quite clear that unless the European Union presents a prudent solution soon, the adamant opposition towards TTIP in general, and ISDS in particular, would only grow stronger. And thus, to assuage the grievances against TTIP contended by the civil society, various stakeholders, several member state governments, and even members of the European Parliament, the idea to establish a permanent, multilateral institution for investment dispute adjudication has been reawakened [17].

Originally, the European Union intended to involve just the United States at first – as an experiment of sorts – and, only if met with success, to eventually invite other investment treaty partners to join in [18]. In the long term perspective, the Commission has far-reaching ambitions for the Investment Court System to gradually replace the *ad hoc* ISDS, and not just in regards to investment treaty relations between European Union, the member states and their counterparts, but also, in investment disputes between third states [19]. Conversely, since United States took a rather aloof stance on the issue, and TTIP has been maligned by the public even more firmly, the European Union turned to looking for other partners to test the new waters with. The initial plan of action – to only involve one investment treaty partner at first – changed, and the European Union has cast its nets wider [20]. In consequence to the new TFA strategy, the European Union now negotiates the provisions on investment dispute settlement under the rules of the envisaged Investment Court System by default [21].

The Commission emphasizes as decisive advantages of the proposed Investment Court System, beside its permanent and multilateral character, high qualification requirements imposed on the prospective judges, establishment of an appeals tribunal similar to the WTO Appellate Body, precisely defined access to adjudication for investors, and a guarantee of the member states' right to regulate [22]. On the other hand, the Investment Court System acts in an analogous fashion to ISDS since investors are still accorded, albeit to a lesser extent, direct claims against member states and/or the European Union, each of whom may be held liable to pay compensation and/or damages.

Finally, with regards to the multilateral character of the new investment dispute settlement proposal, it should be noted that all previous attempts to facilitate a global international investment regime – such as the Draft Convention on the Protection of Foreign Property (1967), the Multilateral Agreement on Investment (1995-1998), and the Doha round of the WTO negotiations – have failed. Yet, despite of the perceived defeat in terms of

universal investment regimes, several sectorial, investment-related agreements prevailed – *e. g.*, the WTO Agreement on Trade-Related Investment Measures (1994) and the Energy Charter Treaty (1991).

3. Commercial relations between European Union and Latin America

Even though the European Union has already developed significant commercial ties to Latin America, these appear mostly trade related or touching upon investment and other "new" areas of commercial interest just marginally. Among the most notable agreements with Latin American countries and regional entities belong the EU-Mexico Economic Partnership, Political Coordination and Cooperation Agreement (1997), the Framework Cooperation Agreement with Mercosur (1999), and the EU-Chile Association Agreement (2002). Additionally, multiple bilateral partnership and cooperation agreements exist between Mercosur member states and the European Union, as well as several bilateral investment treaties are in force between Latin American countries and EU member states. To consolidate these fragmented relations under systematic, comprehensive trade and investment agreements conveys yet another goal of the new EU strategy [23].

The TFA strategy, however, predominantly aspires to modernize the existing agreements with a view to include, beside a full chapter on investment protection and dispute settlement, provisions on public procurement, expanded trade in services, digital trade, competition, state aid, intellectual property rights, etc. [24]. Whilst the other new areas of commercial interest will most certainly be tailored individually – to suit the partner country or regional organization in the best way possible, the investment protection and dispute settlement, in line with TFA, are to be dealt with in a predefined manner; ideally, resulting into subjection under the envisaged Investment Court System regime [25]. Currently, the European Union restarted negotiations with several partners in Latin America – specifically, Mexico, Chile, and Mercosur.

4. The Investment Court System and Latin American countries

Considering the historical circumstances predating the self-government of Latin American countries – explicitly, in regards to colonial exploitation of natural resources and populations, the initial hostile attitude of the region towards increased protection of foreign investors' property has not been surprising at all. The *Calvo doctrine*, having emerged in the mid-nineteenth century, epitomized said philosophy, and gave rise to the *Calvo clause* often used in investor-state contracts as well as concession agreements.

4.1 The Calvo doctrine and Calvo clause

The Calvo doctrine, named after its originator – the Argentinian jurist Carlos Calvo, opposed the idea of granting greater protection (by way of international minimum standards) to foreign investors than that accorded to own citizens [26]. Furthermore, beside the preference for equal treatment of foreign and national property, the Calvo doctrine also subscribed to the principle of economic sovereignty of states (covering, for example, ownership of natural resources, right to regulate, right to expropriate, etc.) [27]. In a similar vein, based on the principle of territorial sovereignty, the Calvo doctrine required aliens to "*submit disputes arising in a country to that country's courts*" and rejected interference of foreign governments on behalf of their nationals (*i. e.*, diplomatic protection) [28].

In consequence to widespread entrenchment of the Calvo doctrine within the region of Latin America, several local constitutions were expanded to contain corresponding provisions [29]. Moreover, Calvo clauses, as a forcible means for an investor to denounce diplomatic protection of his or hers country of origin, were being inserted into public contracts and concessions with intensifying frequency. The validity of said practices has been fiercely contested by the capital exporting countries and former colonial powers; with the view that diplomatic protection is the sole prerogative of states and as such at their absolute discretion [30]. A viable solution to this dilemma was proffered by the US-Mexican General Claims Commission (GCC) in its award concerning the dispute between North American Dredging Company of Texas and the United Mexican States [31]. The GCC indicated a distinction between rights that a claimant can defer, and the prerogatives belonging to his or hers country's government, *i. e.*, those he or she cannot relinquish [32].

Whereas diplomatic protection, and thusly the espousal of claims by foreign governments on behalf of their citizens against host countries, has served as the initial target of the Calvo doctrine upon its creation, rapid development in the international trade and investment realm rendered this objective progressively obsolete. Especially, the inception and advancement of diverse – multilateral, bilateral, universal, and regional – regimes governing international commerce coupled with the establishment of multiple dispute settlement mechanisms, redirected the focus of the newer Calvo clauses to prevent the admissibility of potential investor claims to extraterritorial courts or tribunals.

Eventually, the last major manifestation of the Calvo doctrine's influence has been observed in the 1970's New International Economic Order (NIEO) series of proposals advocated by the developing countries before the United Nations Conference for Trade and Development. The NIEO was based on four key policy demands: firstly, increasing the amount of development aid; secondly, adopting a unilateral preference system for manufactured exports of less developed countries; thirdly, establishing international commodity agreements to stabilize prices of primary products exported by developing countries; and finally, creating new international financial reserves to be redistributed as aid to the less-developed countries [33].

4.2 Recent developments of the Latin American trade and investment policy

Since then, the rapid developments in the international trade and investment environment along with the fast-paced progression of globalization triggered changes in the Latin American attitudes towards extraterritorial jurisdiction. Not only have the Latin American countries initiated cooperation among each other, resulting in the conclusion of several regional cooperation agreements and establishment of regional integrated markets, but they also embarked on a journey of forming interregional and global relations, most notably to Europe and the United States.

By the virtue of being party to a multitude of trade and investment instruments such as the WTO, countless free trade agreements, and bilateral investment treaties, most of the Latin American countries have already distanced themselves from the Calvo doctrine and other protectionist theoretical underpinnings. Additionally, their willingness to cooperate and negotiate with the European Union vis-à-vis the common goal of concluding new (or updating existing) trade and investment agreements, in conjunction with adopting rules on investment dispute settlement, implies a deeper change in the Latin American philosophy on the exercise of commercial relations. Pursuant to this new way of conduct, it does not seem preposterous that the current European Union's negotiating partners from the region of Latin America, particularly Mexico, Chile and Mercosur, appear to be amenable to the idea of the proposed Investment Court System. Actually, considering the narrow range of claims admissible to the ICS, joining this sort of investment dispute settlement mechanism could be a step up from the traditional ISDS-ridden bilateral investment treaties.

5. Conclusion

Considering the European Union's eagerness for conducting trade and investment relations accompanied by enthusiasm for upholding its values, advocating for transparency and effectiveness as well as promoting fair and sustainable development, on one side, and the previous Latin American reticence and reservations in regards to the opening of economies and submission to extraterritorial jurisdictions, on the other, the current manner of conducting trade and investment negotiations between the European Union and Mexico, Chile and Mercosur respectively, may actually be the right fit for all parties concerned. Moreover, the proposed Investment Court System, which the Latin American parties showed interest to join, offers additional safeguards to preserve the public policy space as well as reduces the grounds for admissibility of investor claims, and thusly carries fewer risks for countries to be sued.

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SYSTEMIC BIAS OF OFFICIALS

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Abstract: *The basic assumptions of legislation regulating bias or systemic bias in administrative proceedings, relevant judicial decisions as well as opinions of the professional public, all form a platform by which the author approaches this analysis of one of the phenomena of our time – systemic bias. With regard to sufficient material covering this issue (either the numerous judicial decisions or opinions of the professional public), one may conclude that this concerns a highly relevant and widely discussed question on which no unified opinion exists in the applied and scientific theory legal world. In reflecting upon the attained findings, the author arrives at the opinion on systemic bias as a defined type of bias in general, determined by a society-wide trend to name occurring phenomena, to distinguish them and analyze them. It comes inherently from the established mixed model of public administration. However it does not exist a priori, but only ad hoc in specific cases. Visibility and clarity of systemic bias are not simple nor can they be, however, in light of the potential of danger of bias. Established legislation or its interpretive case law does not facilitate the functioning and decision-making activity of officials today. Nevertheless, more attention should focus rather on the means of exercising an objection to this bias, and on the time and formal structure of the relating procedure.*

Keywords: *local governments, officials, systemic bias, risk of bias, employment relationship*

1. Introduction

Systemic bias of officials in public administration is a fundamental and widely discussed problem in our time. Essential assumptions of this phenomenon, if one focuses on this question on the general plane, can be seen in the model of mixed public administration as established in the 1990s by the restructuring of local government. One may say that at the municipal level, powers are exercised within the framework of independent and delegated powers "by these same" entities. Situations sometimes occur where the municipality, from its position of having delegated powers, is the deciding entity, and simultaneously, based on independent powers, is either the sole participant in proceedings or some other involved participant. A typical expression of systemic bias appears in the question of cutting down trees on which numerous instances of case law have developed. Can officials – municipal employees – deciding on a specific request for permission to cut trees where the applicant and the participant in proceedings is the municipality – thus the employer of these officials – decide impartially, uninfluenced and independently? Is bias absent here or should these officials be excluded from deciding in this matter ad hoc or a priori? One may not expect that officials of the affected municipalities will succeed when deciding in thoroughly overlooking the fact that local authorities have available relatively substantial powers that may interfere in their professional, and consequently their private lives. How does the current legislation, case law or opinions of the professional public reflect this condition?

2. Legislation, case law, opinions of the professional public

The current legislation on "bias" is introduced in Sec 15 in affiliation with Sec 131(4) of Act No. 500/2004 Coll., Code of Administrative Procedure (hereinafter "CAP"). These provisions regulate the question of exclusion from negotiations and deciding on a matter due to "bias" and change of competence through delegation by authorization of a different materially competent subordinate administrative body. The relative newness of this legislation and the existing fundamental case law compels one to mention the previous legislation that was found in Sec 9 an. of Act No. 71/1967 Coll., on Administrative Procedure (Code of Administrative Procedure) valid and effective up until 31 December 2005. There is a gradually occurring determination of bias as such and its further definition, whereupon there is no appearance in legislation of the term "systemic bias", a specific bias reflecting the affected relationship of an official towards a matter or participants in procedures or their representatives, arising from his employment position towards the municipality as his employer – where this official is the sole participant in the given proceedings or some other involved participant. Objections to systemic bias are raised by participants in proceedings, as proven by numerous instances of case law relating to typical communal questions and others. One example is the decision of the Regional Court in Ústí nad Labem of 31 May 2006, case no. 75Ad 9/2014-48 (in proceedings regarding disability pension), where in terms of systemic bias, the court only expressed itself curtly, regarding elucidation of systemic bias as such *"...systemic bias is a form of bias bound to specific persons in individual matters.*"

A non-biased official making decisions is one of the basic guarantees of the right to due process before administrative bodies, which is generally a prerequisite of trust in law and the legal state [1], as arising mainly from the regulation of the Code of Ethics of Public Administration Officials and Employees. Impartiality can be identified with inter alias from the absence of bias. Other than legal aspects may not be taken into consideration by administrative bodies, if this

does not arise from within the space of administrative consideration provided by law. Officials must prevent situations in which they would be exposed to potential conflict of a private interest and the held functional classification. One may consider the legal definition in Sec 14 of the CAP as a circular definition [2], when *"the official is biased in case it is possible to doubt his lack of bias"*. Bias expresses the state of crookedness of the relationship of the deciding official towards the matter itself or to those who are or could be interested therein. The deciding official should decide legally, impartially and objectively. If reasonable doubt exists (in the wording of Act No. 71/1967 Coll. "only" doubt; but in fact the stated variants of legislation do not differ in practice, because legitimacy based on objective criteria and real rational reasons is necessary [3]) regarding the quality of the stated relationship of the deciding official, this constitutes grounds for elimination of this official from deciding in the given matter. A potential risk for the origin of a biased relationship to a specific case may be posed by anything, thus also by an employment relationship of the official with the municipality.

Under Sec 16(a) to (d) of Act No. 312/2002 Coll., on officials of local governments and on amendment to certain acts, local government officials are obliged to uphold the constitutional order of the Czech Republic, legal and other regulations relating to work performed by them, to defend the public interest upon executing administrative activity, and to fulfill instructions of senior officials provided they do not run contrary to legislation. The legal regulation itself does not provide, in the nature of the employment relationship, any guarantees of the absence of bias when exercising their powers. Officials are economically dependent upon their employer, which has an undesirable influence on their decision-making activity.

This condition is called systemic bias. As stated above, the laws of the Czech Republic do not recognize the term "systemic bias". In the quoted provisions of the CAP, lawmakers work with so-called bias. Bias is a specific quality of a relationship of an official to the relationship of a thing, to participants of these specific proceedings or their representatives. Systemic bias has been defined gradually with regard to more raised questions of decision-making at the level of mixed public administration. Does systemic bias therefore even exist as a specific quality of the relationship of the official in his decision-making activity reflecting in itself the established model of mixed public administration, or is it merely a figment of the professional public and case law?

Based argumentatively on the current case law, it is appropriate to mention at least certain decisions. According to the decision of the Supreme Administrative Court (hereinafter the "SAC") of 16 December 2004, case no. 2As 21/2004-67 linked to the legislation Sec 9 of Act No. 71/1967 Coll. *"If a municipal authority decides within its delegated powers on a right or obligation of the municipality, it is not possible absolutely to consider for exclusion its employees due to doubts about their lack of bias in the wording of the provisions of Sec 9(1) of the Code of Administrative Procedure."* In this case, it concerned decision-making of an official of the Municipal Authority of Jičín, on permission to cut a silver maple, where the very applicant was the City of Jičín. Officials of municipalities are permitted in many cases to decide on matters concerning the municipality, therefore factually their employers, but this situation is explicitly permitted by the law and expected, so it cannot absolutely constitute a reason for bias of the employee of the municipal body, despite an employment or similar relationship with such municipality as a participant in proceedings. Doubt about bias of a specific official would be given in such cases only if another fact entered, especially the justified concern of influencing of the official by the employer in a specific case. According to the decision of the SAC of 30 January 2008, case no 6As 24/2007-89, employees of a municipal authority are excluded from negotiating and deciding on a matter, if the municipality as their employer has an immediate and private interest in the result of a decision issued within its delegated powers given by the fact that a property benefit for the municipality would result from such decision. Furthermore, in the decision of the SAC of 10 October 2007, case no. 2As 29/2007-74, dependence is emphasized between the person deciding and the person about whom the decision is made.

An utterly fundamental decision is the resolution of the expanded panel of judges of the SAC of 20 November 2012, case no. 1As 89/2010-119, by which the expanded panel of judges replied to the question of the first panel of judges of the SAC. *"If a local government body decides in administrative proceedings on a matter that concerns the interest of that local government, this is a reason for doubting the lack of bias of the official under Sec 14(1) of Act No. 500/2004 Coll., CAP, the official's employment relationship to the local government at the time, if from the nature of the matter or its circumstances there exists the suspicion that in consequence of this employment relationship, his position towards the matter could be influence also by other than legal aspects.*" In this case, the Municipal Authority of the District of Prague 7 permitted the cutting down of trees and shrubs growing on grounds owned by the applicants, where one of them included the City of Prague. In this decision, the Supreme Administrative Court deals in detail with legislation concerning bias, an interpretation of the term bias, the sense and purpose of protection from a biased person when exercising powers of the administrative body, impartiality and independence, the position of officials of local governments and its specifics, the danger of systemic bias of local government officials in competition with other constitutional and legally protected interests and values, and not the least of which, it examines existing case law. In the opinion of the first panel of judges of the SAC, when judging bias, it should by understood that nobody may be a judge in one's own matter, and that in a dispute between two entities, a third independent entity must always be the one to decide ("nemo iudex in causa sua"). An integral part of the right to due process is the guarantee that an independent and impartial person decides. Impartiality and disinterestedness of this person form one of the main prerequisites of just decision-making, and one

of the main premises of trust of citizens and other legal entities in the law and the legal state. According to the expanded panel of judges of the SAC, one may not view the position of officials of a municipality automatically from the nature of the employment relationship as being "systematically" biased, mainly in light of the aim of lawmakers and the model of public administration in the Czech Republic. Indeed, upon approving the CAP, a variant impacting this systemic (general) bias was considered, but it was not adopted for its lack of sustainability (financial, organizational and structural impracticability of holding the given administrative proceedings in some other municipality). Systemic bias is therefore not a priori, i.e. not an a priori reason for decision-making by other than a materially and locally competent body. Systemic bias is not given broadly. After all, the very legislation and established model of mixed public administration has several legitimate aims, including economy, ensuring the necessary expertise with regard to the expected type difficulty, type character and number of cases, the ability to express local knowledge and achieve sustainable levels of administrative complexity of the decision-making process. The expanded panel of judges conceives so-called systemic risk of bias, given by the mentioned employment relationship as well as the mutual potential danger of impartiality in decision-making, reflecting reality and not its absolute occurrence in all considered cases. Relevance is placed on clarity of the suspicion of the potential for an official to be influenced by other than legal aspects, whereas even a very low level of suspicion suffices. This will concern facts indicating that somebody here exists with an interest in a certain result of proceedings facing decision; meanwhile he has or could have the ability to influence the relevant official through his employment relationship with the local government. These may be phenomena in the political or media sphere, the interest of others within the community of influential persons, behind-the-scenes actors in local politics or business entities, interest traced back to media statements, election campaign promises, specific investment or commercial activities, the very nature and essence of the matter up for decision, its level of controversy or political importance and interests thereto related, suspicion of pressure or an effort to directly influence the decision-making of the relevant official (moreover with the awareness of the government of communal political entities implementing oftentimes particular interests). On the contrary, this will not involve a generally uncontroversial impact on the assets or other sphere of the municipality. Meanwhile, the material interest in the result of the proceedings will be decisive, i.e. not reflecting the formal position of the municipality (e.g. as a participant in the proceedings under Sec 27(1) and Sec 27(2) of the CAP respectively, or a participant under a different law or even in the situation where it will not even participate in the proceedings at all – acting as a different stakeholder altogether). These facts would not be complete without reference to a different opinion, according to which *"the employment relationship of an official with local government is not an absolute reason for doubt on the person's lack of bias in the matter in which this official is to decide within delegated powers in administrative proceedings in favor of the interest of his employer."* One may conclude that this fundamental decision indicates a strong accent on the interest of the municipality and not on this official alone within the fundamental meaning of the employment relationship. However, systemic bias cannot be judged automatically, but rather case by case, and one must therefore speak rather of the risk of systemic bias. Regarding the question of systemic bias or its aspects, other judicial decisions may be mentioned, e.g. the resolution of the Constitutional Court of 23 October 2008, case no. II.ÚS 555/07, the decision of the Regional Court in Prague of 28 November 2014, case no. 45A 61/2012-46, the decision of the SAC of 16 July 2008, case no. 8As 35/2007-92, the decision of the SAC of 10 October 2007, case no. 2As 29/2007-74, etc.

One of the latest decisions is the decision of the SAC of 13 February 2015, case no. 7As 158/2014-30, refusing the cassation complaint against the decision of the Regional Court in Ústí nad Labem of 02 July 2014, case no. 15A 127/2012-137, annulling, due to breach of provisions of the CAP on the procedure of administrative bodies after raising the objection of bias under Sec 14(2) and (3), the decision of the defendant and the decision of the Municipal Authority of Most, Building Office – issued by one of the persons participating in zoning proceedings regarding placement of a construction, specifically energy recovery equipment. Meanwhile, in both administrative and judicial proceedings, the defendant raised the objection of bias against building office employees, particularly leaning on the organizational and personnel-related authority of the mayor of the City of Most, having substantial influence on the professional lives of building office officials and their economic dependency. The Regional Court concluded in this specific case that there exists a high level of doubt about the potential (systemic) bias of all officials of the Municipality of Most, when moreover, neither the building authority nor regional authority reacted to the raised objection of bias through administrative proceedings. This could influence the legality of the decision and the preservation of the right to due process. Despite the introduced decision-making practice and the need to object to bias of specific officials, supported by specific arguments, one may consider, with reference to the aforementioned, an objection leading towards all building office officials, as well as employees of the Municipal Authority of Most, as being sufficiently specific. When judging this specific matter, the Supreme Administrative Court refers to its resolution of 20 November 2012, case no. 1As 89/2010-119, where the existence of "systemic risk of bias" excludes officials of an authority, whose systemic bias it concerns in the wording of the provisions of Sec 14(1) and (4) of the CAP, especially in regard to the indisputable existence of agreements concluded between the City of Most and the sole shareholder of the petitioner, in which the City of Most had declared support for the investment aims of the relevant company. Therefore, the plaintiff could have relevantly objected to the systemic bias of all building

office employees. The procedure of Sec 14(2) and (3) of the CAP, i.e. if a participant in the proceedings raises an objection of bias of an official, is as follows. The official's immediate supervisor or the one holding a similar position decides by order on the objection of bias without delay. Until a decision on the objection of bias is forthcoming, this official can only perform such acts that cannot be delayed. For there to be any sense in having a process decision about whether or not an employee of an administrative body is excluded, a decision on the matter itself must precede this. Therefore, if the objection of bias is raised, the employee otherwise authorized to negotiate on and decide in the matter is obliged to wait until the decision on the raised objection is passed. The law does not allow for deciding on this objection later (compare the decision of the SAC of 11 March 2004, case no. 7A 192/2000-76). In this case, the decisions of the bodies of first instance and appeal were annulled due to the illegal procedure exercised by administrative bodies, when they handled the objection of bias only in the final substantive decision. By referring to this decision, the author wishes to point out not only the relevance of regulating bias as such, but also the upholding of the legal procedure upon suspicion of this bias (whether systemic or not).

Stanislav Kadečka also brings forth an important thought and argumentation in his article published in Právní rozhledy [Legal Perspectives] 13/2005, p. 477 entitled "Is decision-making of the municipality in its own matter truly unbiased?" According to him, the actual employment relationship forms sufficient grounds for a procedure upon the potential of bias, or that the conclusions of the SAC that the "simple" fact when a municipality decides on its own rights and obligations is not a reason in today's regulation for exclusion due to bias, are incorrect conclusions. On the contrary, the author believes, mainly in relation to officials – employees of municipalities employed in municipal authorities – that in such cases, there can always objectively exist doubts on their lack of bias. In her article, the author also refers inter alias to legislation from the time of the so-called First Republic.

3. Conclusion

If we are to achieve objectivity and impartiality of decision-making of officials, strengthening of trust in the correctness of decision-making, fulfillment of the principle of material truth, legality, equality of participants in proceedings, decision-making in accord with the public interest and not a private interest, one cannot help but agree with the need for legislation of possible "systemic bias" of officials deciding on specific matters. However, is it possible to consider a person deciding in the situations outlined above, thus deciding in a matter in which the municipality itself as the employer of a specific official is involved, as a priori biased? Is it necessary to accept the concept of systemic bias or not?

With regards to the aforementioned, the legislation of "bias (generally)" is an essential component of the legal system of the Czech Republic as a modern democratic state, reflecting not only the potential purely personal interest of an official, but also the established model of mixed public administration and the person, the human face of the official as a person entering as an employee into a relationship towards his employer, while applying all characteristics of an employment relationship (superiority, economic dependence, the binding nature of the employer's orders – which is always closer than an "abstract" state, to which the official is responsible by virtue of his office as a person exercising public powers). It is not possible to rely on the legislation on exercising delegated powers, or the obligation of officials to act and decide impartially. Impartiality is an utterly crucial aspect that must be judged not only in subjective but mainly objective terms. According to the finding of the Constitutional Court of 03.07.2001, case no. II. ÚS 105/01, the subjective perspective of participants in proceedings on bias may be a stimulus for its examination, but decision-making must take place exclusively based on an objective perspective. There is an apparent fear of possible influencing of officials, because it is hard and perhaps even naive to expect that employees will decide impartially on a request of his employer. At the same time however, this in essence cannot be reliably proven.

The author believes that the actual employment relationship of officials towards participants in proceedings or other involved participants is not a reason for the primary application of systemic bias (if one considers this to be a real phenomenon). It is always necessary to judge specific circumstances of the given case, thus – whether it concerns cutting down several trees due to their poor health or danger in a municipal park, or substantial clearance of trees out of a developer interest. Systemic risk of bias arises from institutional arrangement and the nature of legal relationships between municipalities and their officials. Systemic risk of bias exists something that always is with regard to the nature of the relevant relationships. Whether, in a specific case, this systemic bias also appears must be judged ad hoc. The legislation starts from the "potential" for bias, and this is characterized by uncertain terms of the relationship towards the matter, towards participants in proceedings or their representatives. If the original drafting of the CAP contained explicit regulation of systemic bias, which was not adopted however – one may consider that subordination of this is occurring by the professional public and case law of a defined and specially named type of bias under general administrative law legislation, where moreover, certain regulations contain their own special regulation, such as Sec 182(4) of Act No. 183/2006 Coll., on town planning and the building code (Building Act). The Czech Provincial Act No. 71/1870 Czech Coll. already contained similar special regulation. Reflecting upon this, it is clear that the desirable special regulation of "systemic bias" and the procedure in such case are a part of the Czech legal system in the most problematic areas still today, whereas in others, one may refer to the subsidiary of the CAP. The author believes that systemic bias exists, but only as the naming of one of several types of potential aspects upon which one may judge bias. Regarding others, one may refer for example to the categorization according to O´Brien published in 2011 in the Irish Journal of Legal

Studies, in his article entitled "Nemo Iudex in Causa Sua: Aspects of the No-Bias Rule of Constitutional Justice in Courts and Administrative Bodies"[2]. In the mixed model of public administration itself, aspects of the hierarchical relationship, the employment relationship and property dependence, along with the relationship of collegiality and loyalty towards the institution, will be undoubtedly important. Naming systemic risk of bias is then just a definition of the condition that systemic bias does not appear always in all possible cases, but rather only ad hoc.
In conclusion one may state – systemic bias does exist. This is true either as the naming of the phenomenon, which arose inherently from the established organization of public administration, or a special institute – named by the decision-making activity of courts, naming the resulting condition in our country. What is much more important is knowing how to correctly establish the system of exercising this bias, its recognition and avoidance of matters of public administration decision-making by biased persons. A further stimulus is rather to consider a system of exercising the objection of a bias, the time and formal structure of the procedure during proceedings, whereas the author attempted to point out at least briefly the relevance of this through one of the latest judgments.

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FINANCING OF ENERGY FROM RENEWABLE SOURCES UNDER EU LAW: SELECTED ISSUES

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Abstract: *In recent years, EU legislation on the promotion of renewables has evolved significantly, as well as renewable energy in the EU has grown strongly. At the same time, the market does not provide the optimal level of renewables in the absence of public intervention. Therefore, in order to reach the European objectives with regard to the expansion of electricity produced from renewable energy sources, public interventions such as support schemes may be necessary to make certain renewable energy technologies competitive. However, it should be noted that under EU law the State aid is generally prohibited unless it is justified by reasons of general economic development. As a consequence, to avoid distorting energy prices and the market, the renewable energy support schemes should be time-limited and carefully designed.*

Keywords: *EU Law, renewable energy, State aid*

1. Introduction

Renewable energy in the EU has grown strongly in recent years. However, the market does not provide the optimal level of renewables in the absence of public intervention. This is due to market and regulatory failures, such as low levels of competition and unfair competition with other fuels, in particular subsidies for fossil fuels. In order to correct such situations public authorities may intervene in different forms at regional, national or local level. At the same time, the remarkable growth of renewable energy over recent years, partly induced by public support, has helped to make progress on environmental objectives but has also caused serious market distortions and increasing costs to consumers. The rich case-law of the Court of Justice of the European Union (the "CJEU") confirms that financing renewable energy may likewise put into doubt the compatibility with the internal market. As a consequence, to avoid distorting energy prices and the market, the renewable energy support schemes should be time-limited and carefully designed.

2. Energy from renewable sources in EU

Renewable energy can be produced from a wide variety of sources, such as wind power, solar power, hydroelectric power, ocean energy, geothermal energy, as well as biomass and biofuels. It should be noted that the use of renewable energy has many potential benefits, including a reduction in greenhouse gas emissions or the diversification of energy supplies. Moreover, it is alternative to fossil fuels and, as a consequence, by using more renewables to meet its energy needs, the EU lowers its dependence on imported fossil fuels and makes its energy production more sustainable.

In recent years, EU legislation on the promotion of renewables has evolved significantly, as well as renewable energy in the EU has grown strongly. This has been prompted by the Directive 2009/28/EC which enacts legally binding targets for renewable energy [1]. The said directive establishes a common framework for the production of renewable energy and the promotion of its use. To do so, it sets binding targets for all EU countries with the overall aim of making renewable energy sources account for 20 % of EU energy and 10 % of energy specifically in the transport sector by 2020. In order to achieve a binding target of 20% final energy consumption from renewable sources by 2020, the said directive specifies national renewable energy targets for each country ranging from 10% in Malta to 49% in Sweden, taking into account its starting point and overall potential for renewables.

It should be noted that every two years, EU countries report on their progress towards the EU's 2020 renewable energy goals. Based on the national reports, the European Commission produces an EU-wide report which gives an overview of renewable energy policy developments in EU countries. According to the latest EU-wide report in 2015 [2], reaching the 2020 renewable energy targets remains fully possible for the EU as a whole and the majority of the EU countries, which shows the figure below presenting expected renewable energy sources deployment in EU member states and 2020 renewable energy targets.

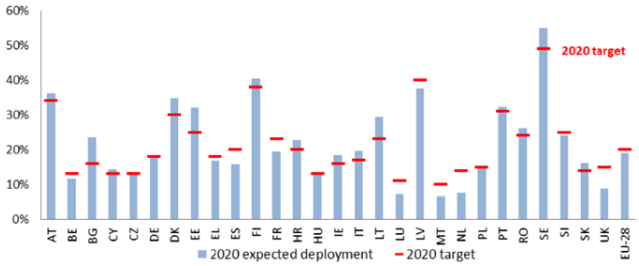

Figure 1: expected renewable energy sources deployment in EU member states and 2020 renewable energy targets, Source: European Commission, based on TU Wien (Green-X) projections (2014)

Notwithstanding the above, renewables will continue to play a key role in helping the EU meet its energy needs beyond 2020. EU countries have already agreed on a new renewable energy target of at least 27% of final energy consumption in the EU as a whole by 2030. On 22 January 2014 the European Commission proposed the energy and

climate objectives to be met by 2030 in a Communication "A policy Framework for climate and energy in the period from 2020 to 2030"(the "2030 Framework")[3]. The pillars of the 2030 Framework are: a reduction in greenhouse gas emissions by 40 % relative to the 1990 level, an EU-wide binding target for renewable energy of at least 27 %, renewed ambitions for energy efficiency policies and a new governance system and a set of new indicators to ensure a competitive and secure energy system.

In order to reach the European objectives with regard to the expansion of electricity produced from renewable energy sources, public interventions such as support schemes may be necessary to make certain renewable energy technologies competitive. However, it should be noted that under EU law the State aid is generally prohibited unless it is justified by reasons of general economic development.

3. State aid under EU law

In order to prevent State aid from distorting competition in the internal market and affecting trade between Member States in a way which is contrary to the common interest, the Treaty on the Functioning of the European Union (the "TFEU") lays down the principle that State aid is prohibited. According to Article 107(1) TFEU any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market.

Thus, to be covered by the prohibition of the State aid within the meaning of Article 107(1) TFEU, a national measure must fulfill the following conditions: (i) there must be an intervention by the State or through State resources; (ii) it must confer an advantage on the recipient; (iii) it must distort or threaten to distort competition; (iv) the intervention must be liable to affect trade between Member States [4]. According to settled case-law of the CJEU, categorization as aid requires that all the above conditions be fulfilled [5].

In the light of the case-law of the CJEU, only advantages which are granted directly or indirectly through State resources are to be regarded as State aid within the meaning of 107(1) TFEU. The wording of this provision itself and the procedural rules laid down in Article 108 TFEU show that advantages granted from resources other than those of the State do not fall within the scope of the mentioned provisions [6].

It should be noted that an economic advantage granted by a Member State constitutes an aid only if it is such as to favour certain undertakings or the production of certain goods. Thus, in order to prove that the measure at issue applies selectively to certain undertakings or to the production of certain goods, it is for the European Commission to prove that it creates differences between undertakings which, with regard to the objective of the measure at issue, are in a comparable factual and legal situation [7].

Moreover, the aid must distort of threaten to distort competition by favouring certain undertakings or the production of certain goods. The case-law of the CJEU indicates that not only aid which distorts competition is incompatible with the common market but also aid which threatens to do so [8].

In addition, Article 107(1) TFEU applies to State aid in so far as it affects trade between EU countries. Under the case-law of the CJEU, the concept of an 'effect' on trade between Member States, which must be understood as requiring that there be an impact on such trade, or at least that there be the possibility of such an impact, means that an interpretation which renders the recovery of the whole of the aid subject to a criterion that trade should be 'fully' affected, in contrast to a 'partial' effect on it, where only a proportion of the aid would be recoverable by virtue of the principle of proportionality, is unfounded [9]. Therefore, the national renewables support schemes that satisfy all the abovementioned criteria, are, in general, incompatible with the internal market, regardless of their purpose, justification or objective [10]. However, in some circumstances government interventions is necessary for a well-functioning and equitable economy. In number of cases, therefore, State aid could be considered acceptable. First, certain aid is declared by Article 107(2) TFEU to be compatible with the internal market. Secondly, the European Commission has a discretion under Article 107(3) TFEU enabling it to determine that certain aid is compatible with the internal market. Thirdly, according to Article 107 (3)(e) TFEU, the Council may decide that other categories of aid which are indicated in the Article 107(3) may be permissible under decision issued on a proposal from the European Commission. Therefore, the Treaty leaves room for a number of policy objectives for which State aid can be considered compatible **[**11**].** In this context, there is a need to refer to so-called environmental integration rule. According to Article 11 TFEU, environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development. It follows from the wording of Article 11 TFEU that environmental protection requirements should be implemented in the all EU policies and activities. The legal doctrine indicates that the mentioned provision has a double objective. On the one hand, it aims to promote sustainable development. On the other hand, it is a provision with the objective to reach the objectives of EU environmental policy laid down in Article 191 TFEU establishing EU policy on the environment and in the overarching objectives [12]. In accordance with the so-called environmental integration rule, said objectives of EU environmental policy should be taken into account and fully considered in all EU policies, including the decisions and activities of other sectors. It is beyond doubt, that using renewable energy contributes notably to achieving objectives of Articles 11 and 191(1) TFEU, including preservation and improvement of the environmental quality through limiting the impact of energy use on the latter. Consequently, financing of energy

from renewable sources may be permissible in a number of cases, however, may be subject to specific conditions.

4. Permissible renewable energy support schemes

In general, to avoid distorting energy prices and the market, the renewable energy support schemes should be time-limited and carefully designed. In order to ensure transparency and to create predictability and legal certainty in the application of the exemptions of general prohibition of State aid, the European Commission has made public the guidance for EU countries when designing and reforming renewable energy support schemes, as well as the criteria when deciding whether aid measures notified to it qualified for exemptions. These publications have taken the form of regulations, communications, notices, frameworks, guidelines, and letters to Member States [13].

As already indicated, the EU has issued a guidance on support schemes [14](the "Guidance") to help governments when they design or revise support schemes. The Guidance indicates that the market does not provide the optimal level of renewables in the absence of public intervention. This is due to market and regulatory failures, such as low levels of competition and unfair competition with other fuels, in particular subsidies for fossil fuels. In order to correct such situations public authorities may intervene in different forms at regional, national or local level. Examples include State aid to certain sectors or companies in the form of grants or exemptions from taxes and charges, the imposition of public service obligations, and regulation through general measures. At the same time, while such measures are necessary to correct market failures and achieve the desired level of renewables, public interventions need to be well designed and proportionate to avoid additional market distortions. Therefore, the Guidance suggests that financial support for renewables should be limited to what is necessary and should aim to make renewables competitive in the market.

Moreover, the European Commission has adopted the new rules on public support for projects in the field of environmental protection and energy i.e. Guidelines on State aid for environmental protection and energy 2014-2020 (the "Guidelines") [15]. Despite the fact that the Guidelines are not a binding act of European Union secondary law they certainly have significance not only for the proper functioning of the internal market, but also, more importantly, they include an obligation to execute the objectives resulting from the EU's political framework concerning climate and energy. In fact, the aim of the new guidelines it to support Member States in reaching their 2020 climate targets, while ensuring that subsidies granted to renewable energy do not cause distortions of competition or a fragmentation of the internal market.

Thus, the Guidelines has replaced and extended the scope of the previous guidelines i.e. the Guidelines on State aid for environmental protection published on 1 April 2008 (OJ C 82, 1.4.2008, p. 1.) to the energy field, in particular to cover State aid to energy from renewable sources, which is based on case practice and policy developments of the recent years. The European Commission has emphasised that during the years of the application of the previous guidelines, a large part of expenditure assessed under those guidelines has served to promote energy from renewable energy sources. Bearing the above in mind, the rules for supporting renewable energy have been modernised to take account of their increasing share in the electricity market and the need to make support systems sustainable for society.

The European Commission has reflected, however, that the remarkable growth of renewable energy over recent years, partly induced by public support, has helped to make progress on environmental objectives but has also caused serious market distortions and increasing costs to consumers. The rich case-law of the CJEU confirms that financing renewable energy may likewise put into doubt the compatibility with the internal market [16].

Thus, the Guidelines and the Guidance aim to better integrate renewables into the internal electricity market in a gradual way, limiting support to what is truly necessary. It is apparent from the Guidelines that in order to allow Member States to achieve their targets in line with the EU 2020 objectives, the European Commission presumes the appropriateness of aid and the limited distortive effects of the aid provided all other conditions detailed in the Guidelines are met (see points 107-137 of the Guidelines).

5. Conclusion

As already indicated, the market does not provide the optimal level of renewables in the absence of public intervention. Therefore, in order to reach the EU objectives with regard to the expansion of electricity produced from renewable energy sources, public interventions such as support schemes may be necessary to make certain renewable energy technologies competitive. However, as indicated in this article, financing renewable energy may likewise put into doubt the compatibility with the internal market. Therefore, to avoid distorting energy prices and the market, the renewable energy support schemes should be time-limited and carefully designed. For that purpose, it is necessary to take into account both the Guidelines and the Guidance, as well as case-law of the CJEU.

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TRENDS IN THE DEVELOPMENT OF INTERNATIONAL TRADE

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Abstract: *This paper is concerned with the matter related to the broad development of world trade. The general objective of the article was therefore to examine the trends in the development of international trade. In order to systematize the problems of the above-mentioned range, articles have been divided into three parts - (each on a different issue). First the nature of international trade was discussed, then the concept and the importance of foreign trade policy was presented, and the last part of the study was dedicated to the general trends in international trade. Considerations are based on two research methods. Due to the prevailing theoretical nature of the work, analysis of the content of available literature on the subject was used, while in the empirical part, statistical analysis proved to be the crucial method.*

Keywords: *economics, trade, development, trends*

1. Introduction

Since the second half of the twentieth century, foreign trade has had a major impact on management processes in individual countries, but it also determines the size and structure of the GDP of most countries in the world. The direction of trade policy is beneficial for the world trade. Limited use of trade barriers requires the coordination of international trade policy. Initially, GATT organization played such a role, and now the World Trade Organization (WTO) deals with it.

The general objective of the article was to assess and analyze the changes in the structure of international trade. The proposed issues are extremely important both from a scientific and practical point of view, because the following questions are still bothering: is significant economic development without the state's participation in world trade possible in a developed economy? Can we therefore talk about economic self-sufficiency?

Commercial policy measures are widely used in many countries in order to achieve certain goals. This means, therefore, that national governments sometimes opt for less economically rational solutions to achieve certain social or political goals. Because achieving certain important social and political objectives often requires sacrifices in the field of economic rationality. However, there is a risk that such arguments can sometimes be abused. The two following circumstances support this fact, namely: the irrational political and social arguments and economic interests of certain entities that can benefit from restrictions on free trade.

1.1 The essence of international trade

In the literature we can find many different definitions of international trade. Most, however, it is determined that this is the charge exchange of goods or services with partners, with permanent residence outside the customs border of the state. There are two areas of this concept: narrower and broader [1]. The first one applies only to material goods that are sold or bought in order to:

a) ensure the supply of goods not produced in the country or to sell abroad the goods produced in excess;
b) gain export profits resulting from obtaining a relative (comparative costs) or absolute advantage in production costs in relation to foreign partners, or purchase the goods abroad in respect to which such advantage was achieved by foreign partners;
c) achieve the scale of production that ensures cost-effectiveness;
d) implementation of long-term and annual plans of trade with individual countries in relation to goods which are important for the country of export and the country of import.

In the broad sense, the foreign trade is determined as the property and credit turnovers (including repayments of loans, borrowings and others) of specific state and current turnovers, which, in addition to trade in goods, consist of purchases and sales abroad (license and know-how), exchange of transport and brokerage services, and other receivables and liabilities resulting from the movement of the population outside the borders and maintaining their own diplomatic and trade posts abroad, pensions, retirements, contributions, international organizations, interest on loans (received and paid), and costs of maintenance of immovable property abroad.

International trade is the source of civilization development, economic progress and bringing nations closer. Without it, economies of the countries would not have the possibility of effective development.

The essence of foreign trade is that the goods and service which is the subject of exchange are moved outside the border of the country. The result of foreign trade is the international division of labor. It was formed by the economic policies of individual countries. It gives the opportunity to specialize production. In addition, it expands domestic consumption possibilities.

The benefits of foreign trade have an impact on many areas, e.g. the society standard of living, or even an increase in prosperity because they are the result of efficient use of resources, labor, capital, but moreover,

intellectual resources and different nature and culture conditions of each country. The consequence of foreign trade is to stimulate economic development, but also technical progress which also results in the development of new technologies. To sum up, this trade creates new needs of the population and the economy, so it expands the external market [2].

There are four groups of factors that influence the development of international trade:

a) the first one concerns the political factors (defined as the presence or absence of various types of political or military conflicts in the international arena),
b) The second group are economic factors, because the state of the economic situation in the markets of the country, and consequently the good economic situation causes an increase in demand for imported goods, and vice versa,
c) the third group consists of implemented trade policy, which is reflected in the four subgroups, namely in the general trends of international trade, liberalism, protectionism and trade policy implemented by the partners,
d) the last, the fourth group of factors are actions resulting from the activities of international organizations GATT / WTO, IMF.

1.2 The concept and essence of foreign trade policy

Foreign Trade Policy is a part of economic policy. It is a set of objectives and measures for their implementation. Its basic tasks include optimal formation of relations of the tested country with other countries. Optimality in this case depends on the political and economic situation, but also on the objectives motivating those who are in power. We can distinguish the following objectives of foreign trade policy [3]:

a) more exports,
b) sustainability of the payment balance,
c) improving commodity structure of trade,
d) increase of country participation in the world trade,
e) getting new sales markets,
f) improving the competitiveness of the domestic industry,
g) foreign debt servicing,
h) restructuring of liabilities.

Due to the fact that the above objectives cannot be achieved at the same time, the hierarchy of their validity and the timetable for implementation should be determined.

In the literature, there are two approaches to foreign trade policy [4]. The first assumes that the policy of free trade is pursued, that is, there is no state intervention in economic relations with foreign countries. This type of policy is based on the belief that market forces shape relations with foreign countries so as to ensure maximization of benefits from the exchange.

The second approach to international trade policy, also called protectionism, assumes that the state affects the economic cooperation with foreign countries through economic and administrative instruments (direct or indirect).

Tools of foreign trade policy may restrict import or stimulate export [3]. There are three groups of barriers:

a) tariff, which include duties, which are taxes on goods crossing the state border,
b) para tariff measures are similar to customs duties, artificially raising the price of imported goods, most often they include variable levies, import deposits, import taxes, and anti-dumping and anti-subsidy duties,
c) non-tariff include administrative measures which specify the conditions for participation in foreign trade, e.g.:

- bans (on import and/or export),
- import quotas (amounts),
- permits (licenses),
- voluntary import restrictions,
- technical, sanitary and other standards,
- anti-dumping procedures,
- exchange restrictions.

Measures, that are able to stimulate the export, are the various types of direct subsidies (subventions), that is the provisions of the state budget for producers of exported goods. There are also indirect subsidies that are used in the form of e.g. tax breaks, preferential credits, or refund of charged taxes. The para tariff tool is therefore sale of goods at dumped prices, that is selling one's products abroad at lower prices than on the domestic market, or at prices below production costs [5].

1.3 General trends in international trade

Among the economic factors (which increasingly shape domestic and foreign policy of individual countries), there is the role of economic cooperation at the international level, which has grown steadily. The current industrial civilization ruins internal markets and determines the expansion outside, at the same time requiring power to achieve different goals, strengthening the position in the competitive struggle [6].

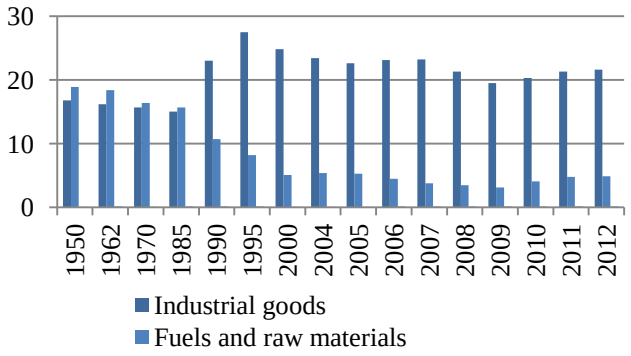
In the twentieth and twenty-first century we can distinguish a number of phenomena and trends that are challenging both for the theory and business practice. The most important ones are outlined below.

1) An important issue is economic growth across the global economy but also in specific areas. It determines the possibilities of solving the socio-economic, environmental and even demographic problems.
2) The subject of the battle for the growth and economic stability, and to take the best location in the international division of labor is international trade, both in practice and in theory it manifests two tendencies (the liberalization of world trade and increasing protectionism).
3) Foreign exchange and financial market. The main area of market self-regulation and regulation by negotiating and institutional mechanism is the exchange rate.
4) International payment situation and the enormity of the debt of part of the global economy relatively to its second part. This imbalance is relatively stable and results from the structural developmental imbalance.

Removing it means a long-term process of deep structural changes.

5) In the branch-layout there is phenomenon of transferring the entire branch of production in other regions of the world. Then, the economies of the most developed countries (post-industrial) transform in the service and information economies.
6) Implementation of new techniques and technologies. There may be, on the one hand, deepening of the developmental gap between the leading economy and backwardness extremities. On the other hand, the new technologies and the information revolution create opportunities to skip stages of development by the countries that are economically delayed.
7) The contradiction between the requirements of the internationalized economic space and its division into countries jealously guarding their sovereignty. It means changing the state's role in the world economy.
8) Another trend is the growing importance of microeconomic level (small and medium-sized businesses are attributed to a growing role in shaping technical progress). This is accompanied by the growing role of mezoeconomical level - large manufacturing, commercial, service and financial organizations, which, using the positive effects of scale and more and more often the formula of multinational companies, apply with their scope the entire world economy.

Thanks to the favorable economic situation and liberal trade policy in international trade, the system of economic triad was created in the 60s with centers in the United States, the EEC and Japan. Their growing role in the global economy and closer trade links have increased the concentration of the world trade in the group of the most economically developed countries. The dynamics of exchange of manufactured goods have also increased, as it exceeded the rate of trade in fuels and mineral resources, and articles of agricultural origin. The size of the world export volume at the turn of 1950-2012 is presented in Figure 1 (and accurate data, describing the size of that export in individual years, was placed in a table attached to the chart).



1950	*1962*	*1970*	*1985*	*1990*	*1995*	*2000*	*2004*
16,8	16,2	15,7	15	23	27,5	24,8	23,4
0,1	0,2	0,1	0,2	0,2	0,2	0,1	0,1
18,9	18,4	16,4	15,7	10,7	8,2	5,1	5,4
2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
22,6	23,1	23,2	21,3	19,5	20,3	21,3	21,6
0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,2
5,3	4,5	3,8	3,5	3,1	4,1	4,8	4,9

Figure 1: The size of the global export volume (USD million) [7]

The high rate of growth in world trade has sharply slowed in the years 1975-1982, since then there has been a reduction of turnovers, which was caused by a large increase of prices, mainly for raw materials and crude oil. During this period, countries exporting oil (OPEC) and dynamically developing countries of South-east Asia, and, among economically developed countries - Japan, became very important. From 1950 to 1985 there was a decrease in the size of world export in the two groups (industrial goods, and fuels and raw materials, but products of agricultural origin remained at a constant low level). With regard to industrial goods there was a decline in export in the years 1995-2009, excluding 2006-2007 - during this period there has been a slight increase. Products of agricultural origin from 2006-2012 were at the constant (0.2) level. While a third group that is fuels and raw materials remained a decreasing trend from an audited year (excluding 2004, 2006) and constantly from 2010 to 2012 there was the growth. Since 2010, we can observe an increase in the size of world export in the three presented groups.

Economic problems such as inflation, high unemployment, declining demand and declining work productivity after the collapse of the Bretton Woods system, intensified in economically developed countries protectionist tendency, which limited the achievements of the GATT in the liberalization of the world trade.

Along with the recovery of the economic situation of the world since the second half of the 80s the international trade also entered a new stage of development, which was characterized by high growth, an increasing share of industrial goods, and above all, the technologically advanced development of trade in commercial services. The processes of regionalization taking place around the world contributed to the geographical structure of international trade. The greater part of the exchange is currently taking place within the existing economic groupings deepening the development of international specialization. Technological progress in the globalization of production processes, the growing importance of multinational corporations and the liberalization of the world trade influenced the development of intra-industry trade, where export and import are made within the same branch of industry.

In recent years, foreign trade has undergone significant changes in the dynamics, geographical structure as well as in objective one. In 2000-2005, world export developed at a rate of 10% per year, reaching at the end of the period the value of 12,574 billion dollars (including 10,159

billion dollars of export of goods and 2,415 billion - exports of services) [7]. In 2005, there was a significant slowdown while deepening differences in the dynamics of export growth. Prices, mainly of industrial and agricultural articles, rose moderately in 2005, but the prices of fuels and raw materials increased by 33% [7]. Such a high increase in the prices of this type of materials may depend on the high demand, which is exceeding supply and inventories and is reported by rapidly developing countries such as China and India, and countries that have high economic growth (United States) and entering a growth phase Japan.

The rapid increase in prices of fuel and raw materials compared with industrial goods led to a deterioration in the terms of trade of well economically developed countries, for countries exporting raw materials, especially fuels. The deterioration of terms of trade could be offset by high growth in export volume. However, it will be possible, if the country has high productivity in sectors with a high share in export.

Analyzing the main directions of trade flows we can indicate several centers and major streams focusing most exchanges. So we can mention the three main centers of export:

a) the European with the European Union,
b) the North American with the United States,
c) Asian with China and Japan.

The main stream of commerce is the exchange of goods between EU member states, moreover, the European Union trade with the United States and exchange between China and the United States should also be mentioned here. It is worth noting that with the increase of mutual trade in the world trade, the problem of imbalance in payment exacerbates. The United States have the largest deficit. It applies mainly to exchanges with China, the European Union and Japan. According to UNCTAD, the size of this deficit is about 2/3 of the world's payment surplus [8]. The European Union and other well economically developed countries also record a high trade deficit.

The share of the leading exporters in world export in the years 1950-2011 is presented in Table 1.

Table 1 The share of the leading exporters in world export in the years 1950-2011 (in%) [9]

1950		**1960**		**1970**		**1980**		**1990**	
USSR	28,8	USSR	29,4	USSR	35,3	USSR	31,2	GER	25,1
GDR	12,2	GDR	9,4	GDR	9,3	FRG	8,1	USSR	15,3
CSK	9,2	CSK	8,5	CSK	7,5	GDR	6,9	GB	7,1

2000		**2001**		**2002**		**2003**		**2004**	
US	12,3	US	11,9	US	10,7	GER	10,0	GER	10,0
GER	8,7	GER	9,3	GER	9,5	US	9,6	US	8,9
JPN	7,5	JPN	6,6	JPN	6,5	JPN	6,3	CHN	6,5

2005		**2009**		**2010**		**2011**	
GER	9,3	GER	26,2	GER	26,1	GER	26,1
US	8,7	FRA	6,9	FRA	6,8	GB	6,4
CHN	7,3	ITA	6,9	GB	6,3	CZE	6,2

GB – United Kingdom; **GDR** – Democratic Republic of Germany; **FRG** – Federal Republic of Germany; **USSR** – Soviet Union; **CSK** – Czechoslovakia; **GER** – Germany; **US**- United States of America; **JPN** – Japan; **CHN** – China; **FRA** – France; **ITA** – Italy; **CZE** – Czech Republic.

Reallocations in the direction of foreign trade flow caused significant changes in the strength of the main exporter. These changes include: the decreasing importance of the US and Japan, for Russia and China; and weakening of the United Kingdom position.

6. Conclusions

To sum up, the trade is very beneficial for many regions. International exchange brings economies of individual countries together and is a necessary condition for the continuation of economic processes and economic development. One of the basic functions of international trade is changing the structure of the national income. By exports of commodities, in which the country has achieved high specialization, it is possible to import consumer and manufacturing products, the production of which is impossible in the country, they are made in insufficient quantities or the production of them is not profitable. Up against the multiplicity and diversity of goods, even the biggest countries are not able to provide the full range of them to its citizens by themselves. Giving up the exchange means the impoverishment of the market with the products made only abroad.

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ANALYSIS OF LINEAR ALGEBRA APPLICATIONS IN ECONOMICS - MATRICES BRIEFLY

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Abstract: *The proposed article presents the application of linear algebra in economics. Therefore, the scope of this discussion mainly concerns the analysis of the matrices. The priority objective of the article was to identify the most important applications of linear algebra in economics and to remind briefly the most important information related to the matrices. So, presented article is a kind of repetition and consolidation of knowledge of students taking up the discussed issues of mathematical economics. In order to receive the subject clearly, the work is divided into five main parts. Development was created using the following test method, namely, it was a content analysis of the available literature.*

Keywords: *algebra, matrices, mathematical economics*

1. Introduction

Algebra is a very large branch of mathematics. However, it is a universal field because it provides different scientific disciplines with modern research tools. The linear algebra and matrix analysis have extensive applications in various branches of mathematics. However, it is also important in the fields of science, technology and economics. Even in economy, the developed methods are used for effective modeling and solving problems related to resource allocation. The methods of linear algebra which were formulated at the beginning of the twentieth century are constantly improving and developing in different directions. It is worth noting that this area has developed in a natural way on the basis of the linear equations systems study. However, the infinitely dimensional part has gone toward functional analysis. While the computational aspects (especially important in the age of computers) are reflected in the separate sciences.

Linear algebra belongs to the department of algebra which concerns the study of space and linear transformations. The composition of its scope should include, among others, the theory of matrices and determinants.

The matrix analysis is an essential tool of modern mathematics, since it allows to present many very complicated relationships in a simple form. Therefore, it is very often used in business practice.

The general objective of the study is the analysis of linear algebra with the special emphasis on matrix. Therefore, the work is a kind of repetition and systematization of the knowledge of the presented area. In addition, the paper discusses the general application of the matrix in economics and other related sciences.

Considering the extensiveness of the presented subject matter, the work is divided into five main parts. Namely, the first one presents the genesis of algebra, while the next ones concern only matrices. So, among others, definition, types and matrix operations were discussed. Finally, the last part of the work introduces the use of the discussed matter in economics.

1.1 The origins of algebra

An important issue that comes to mind for the analysis of algebra is its origin, and therefore, the question - where does algebra really begin? Generally speaking, it can be assumed that the sources of algebra are already in the skills of addition, multiplication or exponentiation of integers. Replacement of numbers into the letters which is used, allows to do similar operations in the context of much more general algebraic systems. An attempt to answer this question refers to the very birth of mathematical idea [1].

In the source materials there are ideas about "algebraization" of mathematics. We are talking about the penetration of algebra methods and spirit to all theoretical and applied branches of mathematics. In particular, it could be observed since the mid-twentieth century [2].

1.2 The definition of a matrix

In economics matrices play a very important role, because a lot of economic relations can be defined using them. Then it refers to the matrix of positive elements. It is worth noting that the concept of matrix is a kind of generalization of the concept of the vector [3].

I. Nykowski in his scientific publications gives the following definition of the matrix: *a rectangular array arranged in m rows and n columns or the matrix of the dimensions m x n (the dimension of the matrix) is called an array of the form* [3]:

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

in which the expressions of matrix are arranged in m rows and n columns in such a way that the symbol $a_{i,j}$ is in the i - this row and j - this column. Therefore, double indicator matrix is called a rectangular matrix. If, however, in the rectangular matrix there is m = n then it is called the square matrix of order n [4], *wherein for each i = 1,2, ..., m and j = 1,2, ..., n a_{ij} symbols, also known as elements of the matrix, represent the real numbers.*

Matrices are marked with large letters of the alphabet and, for example:

$\mathbf{A} = [a_{ij}]_{i=1\ldots m,\ j=1\ldots m}$ lub $A_{m\ x\ n}$.
It is worth noting that the elements of the square matrix for which the number of row and column is the same (i = j) form so-called the main diagonal [5].
Example 1. The main diagonal of a square matrix of size 3 x 3

$A = \begin{bmatrix} -1 & 3 & 4 \\ 5 & 0 & -2 \\ 2 & -7 & 3 \end{bmatrix}$ will take the form $\begin{bmatrix} -1 & .. & .. \\ .. & 0 & .. \\ .. & .. & 3 \end{bmatrix}$,

when it is composed of the elements a_{11}= -1, a_{22}=0, a_{33}= 3.

Furthermore, the two matrices $A = [a_{ij}]_{m\ x\ n}$ i $B = [b_{ij}]_{m\ x\ n}$ are equal if and only if their dimensions are the same but also the corresponding elements of these matrices are equal [6], i.e.:

$A = B \leftrightarrow [\ (m = k \wedge n = l) \wedge (\overset{\forall}{_{i\in\{1,\ldots,m\}}}\ \overset{\forall}{_{j\in\{1,\ldots,n\}}}\ a_{ij} = b_{ij}\ )]$

1.3 Types of matrices

In the literature we can find several basic types of matrices. One of the most popular divisions is the one dividing matrices into rectangular and square.
Among the matrices we can distinguish the following most common types:

a) symmetric matrices - are ones in which the numbers on both sides of the main diagonal are equal, i.e. $a_{ij} = a_{ji}$, e.g.:

$$\mathbf{B} = \begin{bmatrix} 2 & -3 & -ln2 \\ -3 & 1 & 0 \\ -ln2 & 0 & \frac{1}{2} \end{bmatrix}$$

Square matrix is symmetric if and only if $A^T = A$

b) anti-symmetric matrices – the matrix is anti-symmetric when its elements arranged symmetrically with the main diagonal differ only in the sign and the elements of the main diagonal equal zero, e.g.:

$$\mathbf{C} = \begin{bmatrix} 0 & 0 & 2 \\ 0 & 0 & -1 \\ -2 & 1 & 0 \end{bmatrix}$$

Square matrix A is antisymmetric if and only if $A^T = -A$.

c) diagonal matrices - those in which the numbers outside the main diagonal are all zero, e.g.:

$$\mathbf{C} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & \frac{2}{7} \end{bmatrix}$$

d) identity matrices (unit matrices) - are diagonal matrices in which all the entries on the main diagonal are equal to 1. Examples of the matrix first, second and third order are presented further:

$$\mathbf{I_1} = [1] \qquad \mathbf{I_2} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\mathbf{I_3} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

e) column matrices - are rectangular matrices which consist of only one column (which has a dimension m x 1), e.g.:

$$\mathbf{K_{2\ x\ 1}} = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$$

f) row matrices - rectangular matrices consisting of only one row (dimension 1 x n), e.g.:

$$\mathbf{L_{1\ x\ 3}} = [\pi \quad 2 \quad -1]$$

g) zero matrices - are arrays of any dimension with all its entries being zero, e.g. [7]

$$\mathbf{0} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \text{ or } \mathbf{0} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

h) triangular matrices:

- <u>lower triangular</u> – it is a square matrix where all the entries above the main diagonal are zero, e.g.:

$$\mathbf{A} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix}$$

- <u>upper triangular</u> – if all the entries below the main diagonal are zero, e.g.:

$$\mathbf{U} = \begin{bmatrix} u_{11} & u_{12} & u_{13} & u_{14} \\ 0 & u_{22} & u_{23} & u_{24} \\ 0 & 0 & u_{33} & u_{34} \\ 0 & 0 & 0 & u_{44} \end{bmatrix}$$

i) matrix of ones or **all-ones matrix** – is a matrix where every element $a_{ij} = 1$, e.g.:

$$\mathbf{B} = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

j) skew-symmetric matrices – matrices where for each duad (i, j) $a_{ij} = a_{ji}$, e.g.:

$$A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

k) the transpose of matrices (transposed matrices) – when matrices are created from particular matrix by transposition of rows with columns while maintaining their order. If the matrix A has dimensions m x n then the transposed matrix A^T is a matrix of dimensions n x m.
The definition of the transposed matrix shows that $(A^T)^T = A$, e.g.:

$$A = \begin{bmatrix} 3 & 5 & 6 \\ 2 & 1 & 5 \end{bmatrix} \quad A^T = \begin{bmatrix} 3 & 2 \\ 5 & 1 \\ 6 & 5 \end{bmatrix}$$

l) singular matrices - a square matrix is singular if and only if its determinant is 0.

$$A = \begin{bmatrix} 2 & -3 \\ -4 & 6 \end{bmatrix} \text{ or } B = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 4 & 10 \\ 1 & 0 & 6 \end{bmatrix}$$

because det A and det B = 0

m) non-singular matrices - they occur when their determinants are different from 0.

$$\det A \neq 0$$

If a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ [8]

n) inverse matrix of the matrix A is called the matrix determined by A^{-1}, which satisfies the equation: $AA^{-1} = A^{-1}A = I_n$, where I_n is the identity matrix of order n.

If a square matrix A = $[a_{ik}]$ is a non-singular matrix, i.e. det A ≠ 0, there is exactly one inverse matrix A^{-1} for it, which is equal to the adjugate matrix multiplied by the reciprocal of the determinant of the particular matrix.
Determinant of the inverse matrix is equal to the inverse of the determinant of a matrix, i.e, $det\ A^{-1} = \frac{1}{\det A}$

Theorem of inverse matrix:

1) A square matrix is reversible if and only if it is non-singular;
2) If the matrix A = $[a_{ij}]$ of order n is non-singular, then

$$A^{-1} = \frac{1}{\det A}\begin{bmatrix} D_{11} & D_{12} & \cdots & D_{1n} \\ D_{21} & D_{22} & \cdots & D_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ D_{n1} & D_{n2} & \cdots & D_{nn} \end{bmatrix}^T$$

where D_{ij} represent the cofactor of the elements a_{ij} of a matrix A.
Matrix $[D_{ij}]$ is designated as a symbol A^D and is called the matrix of cofactors. Therefore $A^{-1} = \frac{(A^D)^T}{\det A}$ [9]

1.4 Matrix operations

Just like in the case of real numbers set, also in the set of matrices operations are applied, namely, there are three types of matrix algebraic operations. Since we can distinguish matrix addition / subtraction, scalar multiplication and matrix multiplication. It is worth noting that from the listed operations only the second one is always feasible [10].

a) Matrix addition and subtraction

Two matrices can be added / subtracted if and only if they have the same dimensions. When this condition is met, then we can say that arrays have the compatible dimension for adding. Briefly we can add / subtract the corresponding entries. Thus, the sum / difference A ± B of matrices A = $[a_{ij}]_{m\ x\ n}$ and B = $[b_{ij}]_{k\ x\ l}$ of equal dimensions (i.e. m = k and n = l) will be obtained by:

$$A \pm B = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} \pm \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ b_{m1} & b_{m2} & \cdots & b_{mn} \end{bmatrix} = \begin{bmatrix} a_{11} \pm b_{11} & a_{12} \pm b_{12} & \cdots & a_{1n} \pm b_{1n} \\ a_{21} \pm b_{21} & a_{22} \pm b_{22} & \cdots & a_{2n} \pm b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} \pm b_{m1} & a_{m2} \pm b_{m2} & \cdots & a_{mn} \pm b_{mn} \end{bmatrix}$$

b) Scalar multiplication

Each matrix can be multiplied by any scalar (it can, of course, also be a negative number). To multiply the matrix by the number (or in the terminology of linear algebra by a scalar) we must then multiply each element of the matrix by this scalar. Thus, α ∈ K and A ∈ $M_{m,\ n}$ (K). Matrix α A is defined as follows [10]:

$$\alpha\ A = \begin{bmatrix} \alpha a_{11} & \alpha a_{12} & \cdots & \alpha a_{1n} \\ \alpha a_{21} & \alpha a_{22} & \cdots & \alpha a_{2n} \\ \vdots & \vdots & & \vdots \\ \alpha a_{m1} & \alpha a_{m2} & \cdots & \alpha a_{mn} \end{bmatrix}$$

c) Matrix multiplication

Matrix multiplication **A** = $[a_{ij}]_{m\ x\ n}$ by **B** = $[b_{ij}]_{k\ x\ l}$ is feasible if and only if the number of columns of the matrix A (first matrix) is equal to the number of rows of matrix B (second matrix) that is n = k, and the result the multiplication will have a dimension m x l (multiplication has the same number of rows as the leading matrix and the same number of columns as the closing matrix). Accordingly, the multiplication of two matrices is strictly depended on meeting the requirement for dimension (scalar, in contrast, can be multiplied by a matrix of any size). It should be noted that matrix multiplication is not commutative.
Matrix multiplication $\mathbf{A}_{m\ x\ n} * \mathbf{B}_{n\ x\ l}$ is equal to the matrix: $\mathbf{C}_{m\ x\ n} = [c_{ij}]_{m\ x\ l}$, where $c_{ij} = \sum_{k=1}^{n} a_{ik} * b_{kj}$.

1.5 The use in economics

Algebra is widely used in number theory, functional analysis, theory of differential equations, geometry, linear programming but also in other disciplines of mathematics. In contrast, linear algebra is used to study rings groups, etc. By providing their representation in linear spaces - linear representation.
It should also be noted that algebra is also of great use in others so very important studies. Namely, it refers to physics (even by group theory in quantum mechanics), or computer science, statistics (there are often huge sets of data) and econometrics [11].
In the multi-equation econometric linear models matrices define a mechanism of explaining the changes and the interdependence of the model variables (i.e. matrices of coincidence and information capacity).
Matrices are used to quickly solve complex systems of linear equations, i.e. in those in which there are many unknowns and there are many equations. Using matrices we can achieve:

- notation of each system of equations;
- determinant of matrices is used to find the inverse matrix and solving systems of equations using Cramer's formulas;
- the row of matrices allows to specify how many solutions a system of linear equations has [12].

The whole theory of the matrix simplifies solving systems of equations, which, in turn, are used to describe many real phenomena:

- in economics to describe phenomena such as inflation and capital growth;
- in the meteorology for the description of physical phenomena and processes in the atmosphere (weather forecast);
- in physics to describe the motion of two or more interacting bodies;
- in any field in which there is an optimization problem, i.e. minimising or maximising of the particular size or trends of a complex nature (many factors affecting the

phenomenon and many relationships between these factors).

Matrices in addition to the use in solving systems of equations are applied in many other areas, namely to store large data sets, which are in mutual relationship.

Matrices are often used for modeling and measurement of the economic phenomena. They occur as the kernel integral operators defined in sets of probability measures. They are also a part of the inequality degree measurement of wealth distribution, comparing the variation and the risk (convex orderings, Lorenz, Schur), they are also used to construct the mixtures of probability measures, and also to determine the dynamics of Markov processes [13].

The matrix form of economic phenomena presentation can also be found in a variety of contexts, both microeconomic and the macroeconomic: Marx diagram, Leontief and von Neumann models, etc.

2. Conclusions

Algebra is one of the oldest fields of mathematics. Initially, i.e. in ancient times it involved the creation of methods for solving equations. One of its most important areas is linear algebra that deals with study of linear spaces. For the origins of linear algebra we can consider an attempt to solve systems of linear equations using the theory of determinants, matrices, linear spaces and linear transformations.

The arrays have enormous information potential. They are the media of substantial methodological ideas. They are used to present the ordered structures of phenomena in the natural and social sciences. In addition, arrays in a great way help, and sometimes even allow the modeling of objects and processes emerging out of "pure mathematics". What is important is the duality of roles that matrices play in the research process. On the one hand, they are a school of abstraction, and on the other hand they allow the visualization of more general construction.

At the end we should mention a certain very important matter associated with matrices. Well, matrix algebra is applied only in systems of linear equations. So, there is the problem of realism in description of real economic relations by using linear equations - (it depends on the nature of the tested relations). If the assumption of linearity causes a certain degree of realism resignation, then an accepted linear relationship can be such an approximation of the actual non-linear relationship, that its use is justified and reasonable.

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COUNTERVAILING MARKET POWER ANALYSIS: ASESSING MONOPOLISATION TENDENCIES IN BUSINESS ENVIRONMENT OF THE MODERN FINANCIAL SERVICE SECTOR

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Abstract. *The research "Countervailing market power analysis: assessing monopolisation tendencies in business environment of the modern financial service sector" provides a multi – perspective description of the nature, the occurrence sources and the specifics of monopolisation process development in the business environment of the modern financial service sector. The conducted research provides an example of quantitative analysis method application within a unified evaluation framework, while focusing on competitive environment evaluation in the relevant specific industry. The main scope of the aforementioned research is devoted to further developing the existing monopolistic tendency detecting techniques and quantitative analysis practices, while simultaneously considering the broader context of the market power phenomenon, its structure, influence and effects within the chosen specific industry.*

Keywords: *monopolisation, market power, competition level analysis.*

1. Introduction

With the vast development of modern business practices and the advent of the globalized trade system, numerous formerly unquestioned and unchallenged visions of economy functioning paradigms, market mechanisms and conformity of natural laws had already been and still find themselves in a stage of productive transformation, re-evaluated and positively – critical analysis from various scholarly as well as practical perspectives.

As shown by the previous research [2], one of such discussion areas is the process of monopolisation, which takes place in an open market economy and seemingly contradicting with both the economic reasoning for competition – bases resource utilization, product distribution as well as means of production allocation, and the core benefit to society, brought by consumer choice possibilities, namely, need satisfaction in the context of market functioning efficiency.

As it had been previously argued by numerous scholars, while the presence of the full monopoly undoubtedly bring unrecoverable (deadweight) losses to the society, the process of monopolisation is a natural state of affairs, based on both resource limitations and enterprise struggle for profitability, with the mentioned tendencies becoming excessively persistent and particularly visible in time of economic downslide and external shock occurrences [5][10]. The first deviation from the situation of competition, sufficient in terms of intensity and efficiency, is the obtaining of a dominant market position, which is recognized by the European Union Competition Law as not an infringement *per se*, but rather as a potentially risky situation of possible future negative market trend development. As defined in Article 102 of the Treaty on the Functioning of the European Union, "any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market insofar as it may affect trade between Member States" [15].

Therefore, it may be concluded that monopolisation tendencies are a potentially negative development, forever, in certain situation, such state of affair may be "the least of two evils" with regards to the only other economically efficient option being public body interference or even nationalisation, the latter being absolutely incompliant with the current developments in the European Single Market [4]. In this respect, the main question arises in defining the limits of monopolisation process remaining an economically natural and mostly tolerable development in terms of market functioning efficiency fluctuations, adjusted by the consideration of the present stage of business cycle evolutionary maturity and the correspondently generated economic shocks, both internal and external, and defining a boundary, which, if crossed, leads the industry down the path of excessive market power concentration and counterproductive entrepreneurial practices, creating a sufficient basis for competition monitoring public bodies to interfere with the goal of deterring further escalation of monopolisation process unfavourable development [13]. The mentioned development poses an even greater socially - economic threat if affecting relevant markets in the modern financial service sector due to the high dependence of entire economic systems on loan capital attraction and insurance of the conjugate solvency risks.

The objective of the current research is to conduct a full – scale study on the nature of monopolisation process, the role of market power concentration in monopolisation tendencies' progressive evolution and define the degree of external factor influence in accelerating the mentioned occurrences, contextualized within the existing business cycle theories, with the use of analytical, comparative, coherently – logical and economic index analysis methods with the goal of adapting the developed methodology to

the specifics of the modern financial service sector business environment.

2. Theoretical background of the conducted research

Monopoly (from Greek μονο (mono) – one and πωλέω (poleo) – to sell) is a situation of unique advantage presence in any industry, organization or branch that enables the acquiring of benefits, rooting from such state of affairs. In terms of economic evaluation, a monopoly is defined as a special market situation, ensuring a higher level of profitability on the behalf of price growth and production cost cutting with the use of the so-called monopoly position advantages [12]. It may be stated that a position of full monopoly is the exact opposite of a perfect competition scenario and therefore the conduct of competition in the former case would contradict the relevant process in the latter. The main problem at this point may be defined as reality risk assessment in comparison with those of strictly hypothetically – theoretical origins: can an enterprise, if its actions are left unchecked by the authorised competition situation monitoring public bodies, may firstly reach for a dominant position in the market and, if successful, push for a full economic monopoly through the abuse of its leader status-generated advantages [1]?

Therefore, the process of monopolisation may be described as a trend or push towards obtaining a *de facto* full monopoly status by consolidating market power through implementing risks or costs on the existing competitors and accumulating a necessary amount of the mentioned market power to gain a dominant position in the market in order to create internal barriers for potential competitor possible future entry preventive blocking. Such process, while generally being lengthy and in a sense incremental, commonly occurs under competitive economic conditions in contrast to an industry – level shock occurrence scenario, in which case the process of monopolisation may accelerate and conduct at a rather swift pace.

Through a qualitative analysis of the relevant scientific literature, it may be concluded that the existing empirically – theoretical framework provides a solid basis for development of a quantitative analysis of competition structural composition in various heterogeneous product relevant markets and the establishment of a conceptual methodology for the previously mentioned evaluation conduction seems empirically possible. In line with the mentioned logic, a quantitative analysis of the researched problem shall require both an empirical model, capable of detecting monopolistic tendencies under competitive economic conditions or, simply put, a situation of consistent yet commensurate economic growth, and a specialised input data levering derivative algorithm, which, when applied, will reflect the business cycle-imposed market correction in the context of nominal competition conjuncture effective reconfiguration. Furthermore, the specifics of modern financial sector business environment needs to be taken into consideration.

3. Concept of the developed monopolisation process evaluation methodology

An important development in the context of the conducted analysis may be expressed in the form of previously defined factor mutual economic influence and the causality of the relevant process. Considering both prices and market capacity structural composition, it is imperative to acknowledge that, while focusing on supplier market power, the most logical perception of the situation would be achieved through the prism of demand – side analysis. If, as argued Christopher and Shughart [14] an enterprises' market power is proportionate to its size, the measurement of that very aspect shall deliver a precise answer to the addressed question of monopolistic tendency dependence on disproportionate market influence concentration in certain supplier clusters, thus leading to the need of defining an enterprises' size in an analysed relevant market.

Individual supply amount is critically affected by the existing or potential demand amount, with both of the mentioned fundamental economic factors being equalized or mutually balanced by the common denominator of competitive price. Therefore, it may be concluded that the effective size of an enterprise, measured by its presence in a relevant market, is determined by the symbiosis of its individual supply amount and the corresponding sale price. Taking the next step forward, it may be deduced that the individual supply amount multiplied by the relevant existing sale price would equal the turnover of the mentioned enterprise over a defined timeframe. Consequentially, it may be concluded that, if an industry level market power distribution analysis is being conducted or the required perspective dictates an evaluation, only focusing on a certain product type or non – supplementary market structures, the turnover of the supply – constituting enterprises shall deliver the required accurate and objective results [2].

It is important to note that, in terms of harmonizing the used quantitative data, it would be advisable to use the net turnover as the main input element of econometric modelling due to the nature of the mentioned information and the unification of value added tax, excise and other duty rates within the context of a relevant market that is usually the existing state of affairs in most if not all of the modern developed economies. In quantitative terms, dividing the net turnover of an enterprise by the total market consumption capacity, defined as the sum of all involved supplier individual net turnover, expressed in per cent measurements, constitutes an adequate method of individual market share calculation. As a side note, the European Commission takes a similar approach to the problem of enterprise individual market share definition [7].

As argued by various authors [3][8] including Chamberlin [7] and Robinson [9], in a situation of perfect competition no enterprise possesses any market power at all, therefore, by applying the same logic as above, it may be concluded that the market shares in the mentioned situation should be evenly distributed between the involved suppliers, thus constituting a mutually proportionate involvement in the aggregate supply amount creation. If an enterprise increases its individual supply amount in order to

maximize its profit, the marginal revenue sealing, determined by the constantly fixed, industry level unified price will quickly set a maximum financially profitable individual supply amount, which, ceteris paribus, shall be common for all the involved suppliers. Therefore, a situation of perfect competition not only constitutes a completely equal market share distribution, it simultaneously creates a situation of equivalence between the aggregate quantitative measurement of common average market shares and the cumulative individual market power interactional output.

Consequentially, for the purpose of further conducting the current research, the theorem of perfect competition as a structural market conjuncture type creating a situation of non – existent individual market power, based of equal market share distribution, deriving from objective economic limitations to individual supply amount profitable delivering, shall be perceived as having been rationally proven in the above described empirical causality rationalising experiment, conducted with full accordance to Austrian economic school's tradition [11].

Therefore, in case of imperfect or, as defined by Chamberlin [6], monopolistic competition, which is the source of monopolisation process development and monopolistic tendency emergence, market power is distributed unevenly between the suppliers, active in a relevant market, and the trend of exercising the available influence derives precisely from the ability to either neglect or predetermine the retaliation actions of the effective competitors, which consequentially leads to monopolistic tendency strengthening and potential dominant position establishing.

Following such logic, the ratio of cumulative individual market power distribution in case of the existing monopolistic competition to the equivalent value in situation of perfect competition would objectively and rationally reflect on the current state of monopolistic tendency development and, if a dynamic trend is analysed, enable the calculation of such occurrence future emergence probability. The mentioned concept may be graphically interpreted as a deviation interval, reflected in Figure 1[2]:

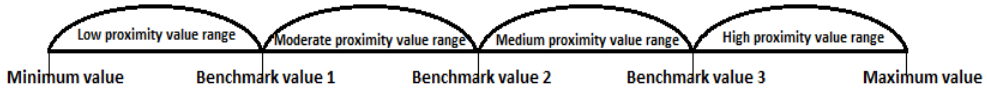

Figure 1: Empirical concept of market power distribution reflecting indicator

As it may be seen from figure 1, the cumulative distribution of market power is reflected in terms of the relevant values' proximity to the conditionality of perfect competition situation, thus establishing an experimental reference framework, enabling the analytical definition of the assessed market to shift from the field of theoretical description to the area of applicable characterising and practical quantitative analysis of the detected peculiarities.

4. The quantitative structure and functioning principles of the developed methodology

In order to incorporate an indicator, reflecting the role and magnitude of individual market power distribution between suppliers, involved in economic activities in a relevant market into the econometrical structure of the developed methodology, while simultaneously considering the theoretical and conceptual basis, established in the previous empirical research [2], an understanding of cumulative market power amount and its disproportionate allocation within a market must be reformatted to suit the specifics of the modern financial service sector.

The number of enterprises in the relevant industry, their net turnover amounts and the corresponding divergence from the state of perfect competition are the necessary structural elements of the relevant indicator. Assuming, that in a situation of perfect competition no market actor, engaged in economic activity on the supply – side of the existing equilibrium, has any market power vis – a – vis direct competitors, the individual market shares must be equal for all of the mentioned supplier in terms of their percentage proportion of the cumulative market consumption maximum level [2]. The mentioned state of affairs had been found to remain relevant for modern financial service sector, if the latter is being assessed through the prism of the relevant market concept, widely used in EU Competition Law. Therefore, the relative market share of a supplier, operating within a market of perfect competition, is inversely proportionate to the number of suppliers, involved in economic activities, which uphold a certain equilibrium sale price and have no artificial entrance or exit barriers [2].

As it had been previously argued, an indicator of market power concentration distribution is based on measuring the state of *de facto* market condition being divergent from those, found in the situation of a perfect competition in the context of enterprise mutual interconnectedness on the supply – side of the general market equilibrium [2]. Therefore, an element of individual market power mutual compensation arises, meaning that competing entities, both exercising their respective market influence with profit maximization goal, simultaneously engage each other in a struggle for and of market power, with the results of the mentioned competitive collision being determined by the difference in employed market power. While presuming that each enterprise is rationally motivated to exploit their maximum market power on a largest possible scale and that every enterprise in a competitive environment theoretically engages every other opponent with the synergetic effect of marker power being a holistic economic phenomenon, the aggregated disproportionality of market power distribution in a relevant market may be determined as the opposite of simultaneous individual market power cumulative mutual compensation, to be

more precise, its excessive amount, which is not being cancelled out by a *pro rata* competitors influence [2].
Therefore, mutual cumulative individual market power compensation, occurring in the relevant markets of the modern financial service sector may be reflected by what for the purpose of the current research shall further be referred to as the financial sector mutual compensation index, which may be calculated in the quantitative fashion, described in Formula 1:

$$MCI_f = \frac{MSH_1}{MSH_e} * \frac{MSH_2}{MSH_e} * \frac{MSH_3}{MSH_e} * \dots * \frac{MSH_n}{MSH_e} = \prod_{i=1}^{n} [\frac{MSH_i}{MSH_e}] \quad (1.)$$

where:
MSH_i – *de facto* individual market share of a supplier, %;
MSH_e – nominal individual market share of a supplier if the relevant market is in a state of perfect competition, %;
MCI_f – financial service sector mutual compensation index, scalar values.

The introduced financial sector mutual compensation index, as any other economic indicator, delivers quantitative outputs that fall under a certain numerical threshold, enabling the interpretation of the acquired results on a conceptually – qualitative level. In order to objectively assess the detected market power distribution, the output value ranges and their corresponding interpretations, specifically relevant for such financial service sector markets like, for example banking or insurance, are summarizes in Table 1:

Table 1 Financial service sector mutual compensation index's quantitative value ranges and their respective interpretation

Value range	[0]	(0;0.19]	(0.19;0.39]	(0.39;0.71]	(0.71;1]
Level of individual marker power mutual compensation	Absent	Insufficient	Fractionally sufficient	Sufficient	Fully sufficient
Economic characteristics	*De facto* full monopoly	Dominant market position or oligopoly	Cross – niche competition	Differentiated monopolistic competition	Classic monopolistic competition
Competitive situation	Absence of efficient competition	Uncompetitive environment	Fractionally competitive environment	Competitive environment	Sustainable competitive environment

As it may be seen from Table 1, the mutual compensation index reflects both the specifics of the analysed relevant market's conjuncture and the state of competition within the mentioned economic unit, thus enabling a multi – scale assessment of business processes from a dual, private and public actor, perspective, the former comprising of market entry attractiveness and the required entrance effort evaluation, while the latter focusing on the health of the existing competition environment in the context of regulatory intervention necessity in line with the established competition policy enforcement. The value ranges, reflecting the relevant competition situation, differ from those of the empirical model [2] due to the functioning and differentiation specifics of relevant markets, comprising the modern financial sector.

5. Conclusions

Taking into account the conduct, results and findings of the described research, the following may be concluded:

- Monopolisation process is most likely to develop in situations of disproportionate individual market power distribution between financial service suppliers, involved in economic activities within a defined relevant market and in this respect does not empirically differ in terms of conduction, depending on the type of the mentioned relevant market;
- Monopolisation process origins are common for most modern business environments, including financial service sector comprising relevant markets, and may be traced to the disproportionate distribution of individual market power within a defined relevant market, while being closely related to the overall interaction intensity between niche – targeting supplier groups;
- Monopolisation development trends and their magnitudes may be evaluated through analysis of individual market power mutual compensation effect in the context of the aforementioned niche – level competition in financial service sector as well as most other types of relevant markets.

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TESTING OF AUTOMOTIVE SAFETY TECHNOLOGIES

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Abstract: *The paper aims to particular elements of automotive active safety elements and their testing. Experiments were made with Volvo V40, which is equipped with many modern technologies. Tested were collision warning with automatic brake and pedestrian detection, which are based on laser, radar and camera.*

Keywords: *active safety, modern technologies, pedestrian detection, automatic braking*

1. Introduction

Since the beginning of the age of motor transport, the attention of vehicle manufacturers was primarily focused on ensuring the safety of the driver and occupants. Thanks the development of modern technologies it could be more focused on other road users with them the vehicle may crash. The most vulnerable of them are considered pedestrians. Vehicle manufacturers therefore endeavor to develop components and automated systems that could mitigate consequences of collision with them or other vulnerable road users (children, cyclists etc.). These are mainly design crumple zones and car equipment technology that can detect pedestrians and avoid a collision or mitigate its consequences.

Technologies, which are the main object of this article, can be classified as active safety features – they should prevent from an accident. Passive safety features mitigate crash consequences of occupants or pedestrians in a collision with a vehicle. Passive safety elements - it are for example subsystems implemented primarily in front of the vehicle. Basic measures are modifications of bow's shape, such as the rounded edges, the front edge of the bonnet moved behind bumper etc.

Testing of modern active safety systems of Volvo V40 was carried out by members of Department of Forensic Experts in Transportation, Faculty of Transportation Sciences CTU in Prague. This car is a hatchback lower middle-class, which shares a chassis platform and some engines with its relative Ford Focus. Volvo V40 is worldwide first mass-produced car with airbag for pedestrians, which is located under hood. Tested model was equipped with active electronic safety systems newest generation including pedestrian detection with automatic braking.

2. Safety equipment

Volvo cars are generally equipped with a lot of active and passive safety elements. These include various active systems such as ABS, DSTC (ESP) - dynamic stability and traction control, EBA – braking assistant, EBL – emergency brake lights, City Safety 2nd generation and others. Tested model had a supplement package „Driver Support Packet 1", which includes newest electronic elements. This above-standard equipment uses radar, laser and camera. Position these components are portrayed on the picture.

Figure 1: Position of camera, radar and laser

3. Tested safety programs

Most of safety programs, which are included in the car, use components noted above. Tested were two programs, which should reduce probability of collision with another object or minimize its impact by decreasing collision speed.

3.1 Collision warning and auto brake and pedestrian detection

The driver is warned and system automatically brakes if the car risks collision with another vehicle in front or with pedestrian. This is based on recognition algorithms and aggregated data from radar and camera. If the car system evaluates, that the situation is dangerous - for example into the track of a vehicle enters a pedestrian, the car warns the driver visually and acoustically (blinking red LEDs). Car brakes automatically and stop (under ideal conditions) before obstacle, if the driver do not react. In the case of a manual gearbox, car turns off the engine and the on-board computer display messages "Automatic braking was activated". After re-pressing the clutch pedal the engine starts.

Collision warning has 3 phases:
1) Visual and acoustical warning
2) Brake support
3) Automatic braking
Whole algorithm works with data from radar and camera. The car should according to predefined scenarios in a particular situation optimally respond. In case of detection of pedestrians, it is necessary that figure fit the parameters of body silhouette. It means that it has to have a head, shoulders, arms, torso and legs. This functionality is however limited by variety of boundary conditions including for example:

- Pedestrian has to be 80 cm tall or taller.
- The system doesn't detect pedestrian carrying some package or bicycle.
- The system isn't active during dusk and night.
- The system is active between 4 and 80 km/h.
- The system effectively brakes up the speed to 50 km/h.

3.2 City Safety

The system helps the driver to avoid the collision in congestion, active is at speeds to 50 km/h. Its task is automatic braking in front of solid obstacle and is based on laser (transmitter and receiver behind windscreen). The automatic braking is activated at the last moment like in case of a collision warning. The system reacts at the last moment, in a situation, when the driver should have started braking because of the elimination of car's intervention into the driver control. It can prevent from the collision, if the difference in speeds between cars is less than 15 km/h. Again, the system is inactive up to the speed of 4 km/h.

3.3 Other features [1]

A) DA (Distance Alert)
Feature that helps the driver keep a safe distance to the vehicle in front. Active is in speed higher than 30 km/h.
B) RSI (Road Sign Information)
It is an application that through the camera reads vertical traffic signs and shows them on the panel display next to the speedometer.
C) BLIS (Blind Spot Information System)
The system is based on radar sensors located in the rear corners of the car, behind the bumper cover. The radars continuously scan the area behind and alongside the vehicle and alert the driver to rapidly approaching vehicles up to 70 m behind the car too.
D) CTA (Cross Traffic Alert)
Cross Traffic Alert uses the radar sensors at the rear end of the car to alert the driver to crossing traffic from the sides when reversing out of a parking space.
E) DAC (Driver Alert Control)
Application designed to attract the driver's attention when losing concentration while driving. Compares the lane markings with steering wheel movements, if these two facts are too different from each other, the car alerts the driver to rest.
F) LKA (Lane Keeping Aid)
This feature applies extra steering torque to the steering column when the car gets close to a lane marking and is about to leave the lane. The system is active at speeds between 65 km/h and 200 km/h.

4. Testing

For every program, or changed boundary conditions, were carried out series of tests. Testing was realized during one day for almost stable conditions. Temperature was 12°C, road was almost dry with a local occurrence of small puddles. On wheels were winter tires Dunlop SP Winter Sport 4D 225/40 R18 with tread pattern over 7 mm. Test speeds were 1 – 45 km/h.
Due to the expected edge case testing of the systems was needed primarily to ensure safety for all participants. For tests was made special dummy from fabric and similar materials, so that in the case of collision wasn't tested vehicle damaged. This dummy was during the tests attached to a pulley system, through which was simulated crossing the road. Besides the dummy were used to test other objects - obstacles in the traffic (e.g. traffic cone).

Figure 2: Volvo V40, dummy and a pulley system

4.1 Standing person

The series of tests were carried out at various predetermined speeds and identical conditions. The system was at a very low speed inactive, by speed over 4 km/h and standing "person" worked without problems. Maximum absolutely safe speed for stopping was 35 km/h. At a speed of 43 km/h there was a slight touch of the front bumper with lower limbs the dummy, which would be in a collision with a pedestrian without serious consequences. The smaller figure than the 80 cm system does not recognize.

4.2 Moving person

If the dummy was during a collision in the axis of the car, then the car launched detection, audio visual warning and automatically stopped in all test trials. But when dummy was off car's axis, i.e. in the area of lights/fender was launched only audiovisual warning without subsequent braking. The car thus identified the presence of pedestrians, didn't start however automatic braking.

4.3 Two persons and unknown objects

When in front of the car were two moving dummies, either in the same direction or against each other, audiovisual alarm was launched, but the vehicle never stopped. This can be considered as a serious shortcoming because on pedestrian crossings often occurs more than one person.

The dummy leading bicycle was not detected, thus the car didn't brake. This result is in accordance with the owner's manual, which states that the silhouette of the body must not be disturbed by other objects.

4.4 Pedestrian detection at night

Unfortunately the system doesn't detect persons during dusk and night. But time of poor visibility should be a target of using, because it is period, when the system could be best utilisable, which shows accident rates in the Czech Republic. Every year more than one third of accidents in the village (i.e. at speeds to 50 km/h, when the system should work with maximum efficiency) involving pedestrians happened in poor visibility. But their consequences are approximately 3 times worse than in good conditions. [2, 3]

The fact that in poor visibility system doesn't work is due to the fact that it is primarily based on image recognition from cameras and radar object distance measurement. So called night vision is under ideal conditions based on recognition of heat emitted by objects – humans. It is system using thermal imaging cameras, which measure and evaluate object's temperature. Considering the price, it has so far used the cheaper technology - infrared cameras coupled with infrared emitters.

4.5 City Safety

Tested was braking and stopping ahead of some solid obstacles various shapes and heights. If the longitudinal axis of the vehicle was directed to object, the car actually braked in time, without any warning. In the case of inattention such a system can significantly contribute to protecting the health and property. Positive aspect is also that the system works even in poor visibility, and in worse weather conditions, because it uses a laser.

5. Conclusions

Pedestrian detection with automatic braking is very perspective function, which can prevent from mortal and serious collisions. The tests show that system has significant limitations and isn't absolutely faultless.

For a fully-fledged and smooth operation the system should be in the future improved especially in the following ways:

- Detect not only one but more pedestrians in front of the car and brakes ahead of them.
- Detect persons smaller than 80 cm (children)
- Detection in poor visibility

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TRAFFIC SAFETY IN ROAD TUNNELS

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Abstract: *Construction of tunnels has positive effect both economical and ecological, as tunnels lower travel time and has low impact on environment. This paper focuses on traffic safety in road tunnels and describes specific issues which may effect how drivers perceive situation or help towards the accident. Paper also describes three the most tragic accidents in road tunnels which led to significant increase of safety requirements. According to analysis of traffic accidents in selected highway tunnels, accident rate in tunnels isn't any different comparing to road infrastructure in rural areas. Relative accident rate which considers length of tunnel, traffic intensity and time, shows that there are 0.10 to 0.73 accidents per million vehicle-kilometers per year.*

Keywords: *tunnel, traffic safety, accident rate*

1. Introduction

Tunnel is civil structure which underpass obstacles like elevated landscape, sea, river or city. Usually serves for roads, railways or pathways. The longest road tunnel in the world is Laerdal tunnel in Norway, which connects cities Laerdal and Aurland. It is 24.5 km long and operates since 27th November 2000 [1]. The longest road tunnel in Czech Republic is Tunnel complex Blanka which is 5.5 km long and operates since 19th September 2015. Tunnel is divided in three partial tunnels (Brusnický, Dejvický, Bubenečský) and is considered as the longest city tunnel in Europe [2].
Construction of tunnels has positive effect both economical and ecological, as tunnels lower travel time and has minimal impact on environment. According to analysis of traffic accidents in selected highway tunnels accident rate isn't any different comparing to road infrastructure in rural areas. But tunnels also represent dangerous places on civil infrastructure because consequences of traffic accidents are more serious than on open roads, especially when accident results into fire [3] [4].

2. Specific issues of road traffic safety in tunnels

Behavior of drivers in tunnels is different than on open roads. Enclosed space in tunnel may summon specific issues like feelings of imprisonment, claustrophobia, fear, issues with sight distance due to dimness or transition from light to dimness, monotony of surrounding and loss of orientation where vehicle is. Drivers tend to behave in tunnels more carefully but also more convulsively and are easily subject to abbreviated behavior [5].
Next specific issue in tunnel is worse lateral friction of carriageway. That is why speed limit in tunnel is lowered to 80 km/h or 60 km/h. Worse friction is caused by different climate inside the tunnel compared to outside. Accumulation of exhausted gas, dust and debris which settle on carriageway has (due to lack of wind, rain, etc.) negative effect on lateral friction. Effective measure is consistent maintenance [6].

3. Tragic traffic accidents in tunnels

Three the most tragic accidents in road tunnels happened in European tunnels under Mont Blanc, Tauern and St. Gotthard. These accidents caused numerous fatalities and bring more attention to traffic safety in road tunnels.

3.1 Accident in Mont Blanc tunnel

March 1999, in 11.6 km long road tunnel, accident of truck full of four and margarine resulted into fire. Cargo wasn't any dangerous, however due to fire 39 people died. Fire lasted for 53 hours and caused major damage to the tunnel, tunnel was closed till March 2002 [7] [8].
Tragedy was amplified due to mistakes in tunnel security and coordination of rescue operations. Rescue was done by French rescue units, Italians weren't even informed. Next mistake was made in ventilation set up, which brought fresh air inside the tunnel and helped to spread the fire. Lack of oxygen (due to fire) inside the tunnel made it impossible for cars to leave the tunnel, because engines weren't able to work, same problem forced firefighters to walk the tunnel on foot [7] [8].

Figure 1: Accident in Mont Blanc tunnel [9].

Leaders of security of both sides of tunnel were found guilty and sentenced to 6 months in jail. Driver of the truck was

sentenced to 4 months conditionally. Original cause of fire was never found, speculations inclined to cigarette butt [7].

3.2 Tauern tunnel disaster

May 1999, in 6.4 km long highway tunnel between Salzburg and Villach started fire. Due to tragedy 12 people died and 49 were seriously injured. Fire lasted for 14 hours and caused damage to the tunnel, which resulted in 3 months of repairs. Cause of the fire was truck carrying paint accident, driver was unable to slow down fast enough and smashed 5 other vehicles. Driver of the truck was sentenced to 2 years in jail [10].

Figure 2: Tauern tunnel disaster [11]

3.3 St. Gotthard tunnel accident

St. Gotthard tunnel through Alps from Germany to Italy is 16.9 km long. In October 2001 widespread fire occurred in tunnel, cause was head-on trucks collision. Afterwards alcohol was found in blood of one of the drivers. Due to accident 11 people died. Fire last for about 6 hours and tunnel was for 2 more months closed for repairs [12].

Figure 3: St. Gotthard tunnel accident [12]

4. Accident rate in selected Czech tunnels

Not long ago Czech press presented article, which says that Czech drivers cause in tunnels more traffic accidents than Austrian or German drivers. Article says, that in German tunnels happen 0.23 accidents per million vehicle-kilometers, in Austrian tunnels 0.01 accidents and in Czech tunnels it is 0.31 accidents per million vehicle-kilometers. Recent research, which monitored behaving of Czech drivers in tunnels, revealed that Czech drivers drive 0.3 m closer to the middle of the carriage way in than they are on open roads [4].

To analyze accidents four tunnels on Czech highways were selected. Klimkovice tunnel on highway D1, Valík tunnel on highway D5 and Libouchec tunnel and Panenská tunnel both on highway D8. Analyzed were all traffic accidents which, according to Czech Police's identification, happened in tunnel. However, results show that this identification may not be accurate enough, especially accidents near tunnel portals are sometimes identified as "in tunnel" and sometimes not. This may be caused by different approach of different police officers or inaccurate determining of accident's location in map. And especially near tunnel portals count of accidents are higher.

For comparative analysis were selected standard indicator of relative accident rate, which included not only absolute number of accidents, but also traffic volume, duration or time period.

Indicator of relative accident rate is the most common used characteristic which indicates the probability of an accident on selected section of road in relation to traffic flow.

$$R = \frac{N_0}{365 * I * L * t} * 10^6$$

where, R = relative accident rate (number of accidents/ millions of vehiclekilometers per year) and N_O = number of accidents and I = average daily traffic (vehicle/24h) and L = length of section (km) and t = monitored period of time (year).

4.1 Klimkovice tunnel

Kimkovice tunnel is located on highway D1 near Ostrava city and contains two tunnel tubes 1076 and 1088 meters long. Each tube has 2 traffic lanes and carriageway is 9.5 m wide. Speed limit is set to 80 km/h. Tunnel started operation in May 2008. Tubes are connected by evacuation passages. During construction was for the first time in Czech Republic used so called fireproof concrete, which contains polypropylene fibers. Fibers vaporize during fire, creates space for concrete to spread and helps to avoid structure failure [14].

Since start of the operation 5 accidents happened. The most common type of accident is collision with solid obstacle. Just one accident resulted in injury and only light injury. Main cause of three accidents was not enough driver attention. Two from these accidents happened on icy road and two happened during night. One accident resulted in fuel or oil leakage. Relative accident rate is 0.12 accidents per million vehicle-kilometers per year [13].

Figure 4: Traffic accidents in Klimkovice tunnel (all accidents regardless accident place)

4.2 Valík tunnel

Valík tunnel is located on highway D5 near Pilsen city and contains two tunnel tubes 380 and 390 meters long. Each tube has two traffic lanes and carriageway is 11.5 m wide. Tunnel operates since October 2006 and speed limit is set to 80 km/h. Tunnel fulfills requirements of European standards, such as automated ventilation, surveillance and control systems, SOS system, etc [15].

Figure 5: Traffic accidents in Valík tunnel (all accidents regardless accident place)

In Valík tunnel only 3 traffic accidents happened since 2007, one of these resulted in light injury of 3 people. Most common type of accident is collision with solid obstacle. Main cause of two accidents was insufficient attention of driver. Two accidents happened on dry carriageway, one on wet surface. One accident resulted in fuel or oil leakage. Relative accident rate is 0.10 accidents per million vehicle-kilometers per year [13].

4.3 Libouchec tunnel

Libouchec tunnel is located on highway D8 near Libouchec village. Tunnel contains two tunnel tubes 670 and 520 meters long. Tunnel operates since December 2006 and has carriageway 9.5 meters wide. Speed limit is set to 80 km/h. Tunnel fulfills requirements of European standards such as automated ventilation, surveillance and control systems, SOS system, etc [16].

Figure 6: Traffic accidents in Libouchec tunnel (all accidents regardless accident place)

Since 2007 there were 13 traffic accidents, none resulted in health damage. More than half of accidents were identified as collision with solid obstacle, almost 70 % of accidents were caused by insufficient driver attention. Five accidents happened while carriageway in tunnel was wet or icy and five accidents happened during night. Two accidents resulted in fuel or oil leakage. Relative accident rate is 0.73 accidents per million vehicle-kilometers per year [13].

4.4 Panenská tunnel

Panenská tunnel is located on highway D8 close to Libouchec tunnel. Tunnel contains two tunnel tubes 2168 and 2116 meters long. It operates since December 2006 and has carriageway 9.5 m wide. Speed limit is set to 80 km/h. Tunnel fulfills requirements of European standards such as automated ventilation, surveillance and control systems, SOS system, etc [17].

Since 2007 23 traffic accidents happened in tunnel, none resulted in health damage. 16 accidents were identified as collision with solid obstacle, 65 % accidents were caused mainly by insufficient driver attention. Carriageway was wet or icy during 6 of these accidents, 10 accidents happened during night. One accident resulted in fuel or oil leakage. Relative accident rate is 0.36 accidents per million vehicle-kilometers per year [13].

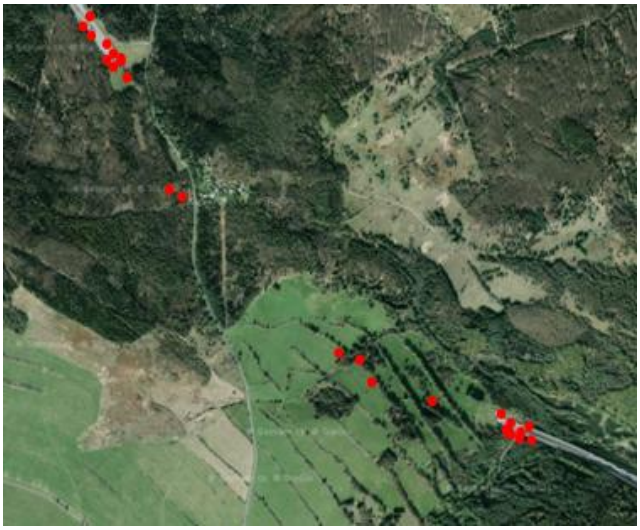

Figure 7: Traffic accidents in Panenská tunnel (all accidents regardless accident place)

6. Conclusions

Analysis of accidents on selected highway tunnels shows that accident rate isn't any different in tunnels than on open roads in rural areas. Relative accident rate, which reflects length of tunnel, traffic intensity and time, shows that there are 0.10 to 0.73 traffic accidents per million vehicle-kilometers per year. The most dangerous from analyzed tunnels is Libouchec tunnel located on highway D8. The least dangerous is Valík tunnel which is also the shortest one and the widest one analyzed. Most common type of accidents are collisions with solid obstacles, mostly tunnel walls or guard stones. Most common cause of accidents are situations where drivers don't pay enough attention to driving. Important safety measures to prevent tragedies are primarily adequate tunnel lighting, ventilation, surveillance systems, emergency lines and bays and emergency exists.

Acknowledgements

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IDEOLOGICAL PROPOSE IMPROVEMENTS TO THE INNOVATION POTENTIAL SIZING MANUFACTURING COMPANIES IN SLOVAKIA

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Abstract: *New trends of business are created, such as business outside of business. Currently people do not always require particular space provided by an employer to perform their work, but the new information techniques and technologies enable performing the work outside the company. Here, we can point out, that in comparison of tangible and intangible sources, the importance of intangible sources is still rising. In the past man had to travel for work, however, currently there is a trend that man create work himself, with his own creative activities and ideas. This is what vision of modern businesses is built upon. The aim of this research was to analyse innovation potential of manufacturing businesses using searched data about innovating activities of businesses in Slovakia. Given coefficients at statistical verification were the measure for research and development in businesses. Out of asked 80 manufacturing businesses, 31 took part on the research, which represents 38,75 % of returned questionnaires. Research was conducted on a basis of combination of selecting random businesses. We could establish that it is necessary to seek further forms of creative possibilities, because they are the single perspective source of economic development in the future.*

Keywords: *innovation, innovation potential, intangible capital*

1. Introduction

Innovations are the main drive mechanism of competition growth. This growth capability is directly dependent on an acceptable concentration on knowledge, which is based especially on education, resourcefulness, creativity, experimenting and ability to be innovative. The core of innovation is in creating new knowledge, as a result of scientific, experimental and developmental activities and ability of workers to apply this knowledge in business environment, in an area of product manufacturing, creation of service as well as process creation. In order to succeed in an environment of market economy, business must seek new opportunities offered by market and thus increase its innovation activity that leads to development of innovation potential. In fact, it is innovation potential that describes innovation environment of a company in which innovations are created, implemented and improved. Innovations are the main moving mechanism of economy development and its implementation is a necessity that guarantees business to survive in ever changing business environment. Innovation and innovation potential of businesses contribute to growth of work productivity, growth of product quality, development of innovating activities and qualification of working labour. Innovation process contributes to growth and development of product quality in every phase of production process and thus increases economic prosperity of business, satisfaction of consumers and is one of the most significant means in competition.

1.1 Literature review

In a current dynamic world of constant technological development, the importance of intangible capital as a competition tool of business grows. Intangible capital represents valuable source for creating of economic wealth of a business. Manufacturing businesses have started assessing its value and seek effective steps of process management aiming to maximise profit coming from intellectual wealth. Turbulent technological progress impacted definition of innovation also from author perception of the world. The term innovation has its origin in Latin innovare which means create something new. In its previous meaning innovation was understood as a change in behaviour. An attempt for closer specification resulted in a vast amount of definitions.

In general, term innovation is defined as a creative process which combines two or more existing objects in a new manner with an aim to create a unique new product [1]. Innovations are fundamental source of economic growth of society. Actions such as inventing human activities, thinking, changes of intellectual character, and changes in human know how, e.g. new inventions, discoveries, and knowledge of scientific and technological development could be all considered a source of innovation. The term innovation is used to name this universal source [2].

J. A. Schumpeter is considered the founder of economic discipline dealing with research of innovations and their processes. His understanding became a fundamental base for further studies. However, at first he does not define innovations as we know them, but only as new combinations of development changes especially in a market production. Modern definitions of innovations are discussed by G. Mulgan and D. Albury according to whom we can define innovations as implementation of a new or significantly improved product, process or service, new marketing or new organisational method which brings vital improvement in effectiveness, efficiency and quality [3].

P. F. Drucker identified 7 sources of innovation opportunities which include unexpected events, differences between the real and the ideal state, the need of process

change, change of the market and sectors, demographic changes, changes in customer moods and perceptions and new knowledge [4]. Innovation is not a single process; it is a long and cumulative process of number of organisational decisions, starting from the creation of a new idea until its realisation phase. New thought regards perception of new needs of customers or new way how to produce [5].
K. Atuahene-Gima researched innovations in China and came to conclusion that innovations of product must support innovations in areas of marketing, branding, distributions, delivery and production in order for product to be successfully established on the market [6].
J. R. Cooper provides an alternative view. The emphasise is given on the fact that innovations are realised in different ways and he takes into account demands on structural changes in organisations and divides innovations as follows: revolution and value added innovations, technological and administrative innovations, regarding processes and product innovations [7].
Accoridng to E. B. Bayercelik, F. Tasel, S. Apak the most significant factors influencing the development of innovation activities involve financial factors, size of a company, institutional factors, technological capabilities, customer preferences, economy factors, cultural factors, managerial skills, ability to learn, orientation on market and competition advantages [8].
J. DeGraff states that it is crucial to know the definition of innovation, because if there is not a collective definition to explain innovation there is a small chance to reach the same aim together with your co-workers. This is especially important for entrepreneurial businesses which mark fast increase to something better and bigger. J. DeGraff warns that everyone works on innovations, but if the same definition is not shared everyone creates their own opinion on what innovation means and then it is very difficult to work towards the same objective. According to J. DeGraff, functional definitions are easily recognisable for anyone without regards on type of an organisation. He shares the view on innovations together with M. McLuhan and sees innovations as increasing of something, elimination of something else, return of demands from the past and change in process other way round [9].
Analysis of all above mentioned definitions led us to abstract definition involving characteristic treats of innovation. Innovation is a qualitative and quantitative change of product or process; it comes from intelligence of human mind that leads to improvement of uniqueness of a product or process by increasing its qualitative function ensuring the growth of management and efficiency of the subject in time. It creates monetary and added value for consumer depending on the essence of given innovation.

2. Methodology and data

The aim of this research was to analyse innovation potential of manufacturing businesses using searched data about innovating activities of businesses in Slovakia. Given coefficients at statistical verification were the measure for research and development in businesses. Out of asked 80 manufacturing businesses, 31 took part on the research, which represents 38,75 % of returned questionnaires. Research was conducted on a basis of combination of selecting random businesses.
Critical area: $\chi^2_P > \chi^2_{1-\alpha}$ [(r-1).(s-1)] when α is level of importance, or (1-α) is credibility. $\chi^2_{1-\alpha}$ [(r-1).(s-1)]

At level of importance 0,05:
$\chi^2_{1-\alpha}$ [(r-1).(s-1)] $= \chi^2_{0,95}$ [(5-1).(5-1)] = 16

With credibility 0,95 or at the level of importance 0,05 we accept the hypothesis that there is statistically important dependency between coefficients.

Calculation for chi-quadrat: $\chi^2 = \sum \frac{(O-E)^2}{E}$

Chi -quadrat = 80,786

Calculation for degree of freedom: df=(s-1)*(r-1)

df =(5-1)*(5-1)

df=16

p= 0.00000106
Hypothesis was confirmed as the value of p < than 0,05

If we discovered, there is an association between statistical elements we can precede to the next analysis which is characterization of intensity of association based on relation.

$$Q = \frac{(ab).(\alpha\beta) - (a\beta).(\alpha b)}{(ab).(\alpha\beta) + (a\beta).(\alpha b)}$$ [10]

where, *a* = statistical variation and *b* = statistical variation;

Q = 0,9568

3. Data analysis

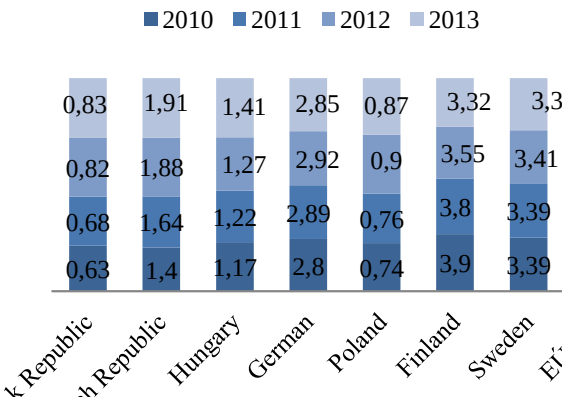
Total budget of expenditures for research and development depends on gross domestic product of a country within given year. Total GDP (gross domestic product) of Slovak Republic in researched period 2010 - 2013 has an increasing character. The share of expenditure for research and development of the GDP in researched period grew. It is interesting that in a year 2009 (62794,40 mil. Euro) total GDP decreased by 4048 mil. Euro in comparison with year 2008 (66842,40 mil. Euro), although the share of expenditure for research and development increased by 0,01 % that means from 0,47 % to 0,48 % of the GDP. Annually, in a researched period, the budget for science and research grew by 0,05 % for first 4 monitored years. In a year 2012, according to the statistical figures there were allocated means for science and research in amount of 113,9626 mil. Euro which is more than in 2011 by 0,14. In 2013 the budget for science and research was at the level of 0,83 %. In comparison with a year 2012 this represents growth by 0,01 %. In 2013, member countries of European

Union spent on research and development all together 275 milliard Euro

Slovakia in comparison with other world countries belongs to countries with lowest innovation efficiency, while it also reaches very low average amongst the countries of EU. Out of 28 countries of EU we have reached the 23. Place in innovation performance and we belong to the group of so called three catching-up countries. There are several reasons to fall behind, e.g. low budgets of public and private sector businesses for research and development. Average budget of EU 28 is 1,82 % of the GDP, while in Slovakia it is only 0,48 % of the GDP, where public means represent 55 % out of all expenditures for research and development. Despite growing tendencies the level of expenditure for research and development is still very low in comparison with other EU counties with strong economies. For example, in 2011 Korean Republic reached 4,04 % of GDP and in Japan it was 3,38 % of the GDP. In 2012 in the USA budget for research and development reached 2,91 % of GDP. However, in China (1,98 % in 2012) and Russia (1,11 %) budget for research and development remains below the average of European Union.

Government considers as the main causes of this state poor research base without specific goals, lack of large businesses investing into research, ineffective support from public sector, low motivation of researchers etc. The share of expenditure of the GDP for science and research in individual countries of EU is shown in chart 1. The share of expenditure on research and development of the GDP of states of European Union.

Chart 1 The share of expenditure on research and development of the GDP of states of European Union.



Depending on researched data we defined parameters of statistical dependency between surveyed elements of statistical sample, which were manufacturing businesses in Slovakia.

4. Results and discussion

Within the research we paid attention to main pass of production of a new product. After analysing responses of participants of the research regarding the time period of pre-production and production cycle of the main product we came to conclusion that this time period is influenced by number of factors of the industry, to which the business belongs to, including complexity of their products, type of production program, type of production. Collected time periods were different. Some manufacturers state that both pre-production and production cycles could be measured in minutes, hours, even days, months or years. However it is clear that pre-production cycle, research and development of a product takes longer than the production process itself. This information comes from division of pre-production phase into several important activities that are necessary to be performed precisely in order to achieve the most positive results in production.

Project phase itself may last couple of years and the aim of businesses is to shorten the duration of each step. Time period of production phase differs based on the demand for product, whether it is a new production or repeated production, difficulty of requested solution, complexity and character of the product and its complexity. In an automobile industry it may take 5 and more years considering one model of car. The lowest time period could be 2 -3 years. Brand is still on high demand on the market. The company registers elastic demand for selected product and therefore there has been number of modification - facelifts within more than 10 years of its production. As stated before the longest phase is the pre-production cycle which is decided into various activities. One of the most important activities is design of new products, which consists of development, construction and technological preparation.

By conducting research of manufacturing businesses in Slovakia we found out that the share of development phase is less than 50 % out of the whole cycle period. Development in the most cases represents 0 % - 5 %. This means that Slovak business devote minimum time to research and development. Companies that stated their shaw of development phase in-between 21 % and 40 %, even 41 % - 60 % include into this stage also activities such as modification, corrections, innovations of first degree, building and testing of prototypes and models, building of tools, template, forma and chip using new technologies, construction and processing of chosen alternative for new or improved materials, facilities, products, processes, systems etc. They are, however, not developing entirely new product. Businesses replace research and development phase of new product with external form, using passive license, often also by obtaining production or pre-production know how. Performing development on their own includes activities such as creation product proposal, proposal of product construction, construction preparation of prototype production, technological preparation of prototype production, production, trials, and prototype approval. The main reasons why businesses prefer purchasing licenses are time and financial aspects. By purchasing patent of a new product, business is able to respond to the demand of the market faster. From the point of fast technological development, license purchasing is the most effective alternative for most businesses.

Businesses indicated they put bigger emphasise on phases

of construction and preparation of a new product. The main objective of subsidiaries is put on technological preparation of a product. As mentioned before, there is couple of reasons for that. We could mention connection between low level of granted patents and given low share of development in businesses. It is clear that if there is no research and development, there will be no results that could be later patented.

Individual phases of production of a new product depend on good strategic decisions and constant investments.

Within the support of small and minim businesses it is necessary to use tools and methods that could be sustainable for a long term. Slovak economy is represented in 99,89 % by small and medium businesses that employ 72,23 % of all employees within the private sector. As a result of conducted research we came to the following recommendations, which are presented in form of algorithm, ideological model:

Parent company should motivate to transfer certain part of research and development of prototypes to its subsidiaries.

The next proposal in the area of innovations, research and development is implementation of spin-off projects into business activities. Building of technological parks, centres, divisions, this would act as organizations for scientific, production, construction and project activities which would bring benefit to economy and educational system. Their main purpose is development of mechanics, technologies and their following transfer.

Creation of program supporting the start-up businesses is funded especially in form of risk financing. In comparison with start-ups, strategic alliances are more favourable especially due to better spreading of risk, which in case of start-ups is all risk beard by businesses itself. The main disadvantage of strategic alliances is undesirable evasion of know-how, which is cause by co-operation and mutual decision making on serious strategic questions of business.

The tool that could increase competitiveness of small and medium businesses as well as increase prosperity of regions through innovation stimulations and transfer of knowledge and skills in area of innovation is a program to support the transfer of knowledge - Knowledge transfer partnership - KTP.

Implementation of program to support use and filing of patents would provide help in form of offering sufficient information associated with patents.

There is revitalization of support for starting small and medium innovating businesses through incubators. This program includes creation of investment funds, execution of supporting activities to ensure guidance and partial coverage of operational activities of engaged incubators.

6. Conclusions

We could establish that it is necessary to seek further forms of creative possibilities, because they are the single perspective source of economic development in the future. New trends of business are created, such as business outside of business. Currently people do not always require particular space provided by an employer to perform their work, but the new information techniques and technologies enable performing the work outside the company. Here, we can point out, that in comparison of tangible and intangible sources, the importance of intangible sources is still rising. In the past man had to travel for work, however, currently there is a trend that man create work himself, with his own creative activities and ideas. This is what vision of modern businesses is built upon.

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OPTIMAL OPENCL KERNEL CREATION FOR DIGITAL IMAGE CORRELATION ALGORITHM

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Abstract: *Two-dimensional digital image correlation (DIC) is a well-established algorithm for quantitative in-plane deformation measurement of a planar object surface in the field of experimental mechanics. Its results provide full-field displacements, often with sub-pixel accuracy. The algorithm is a good candidate for parallel computation, both using threads and GPU for computation. While GPUs are very good for parallel computation, it can be quite hard to develop a solution, which will be optimal on all available computation devices and input data configurations. In this paper we explore the possibility to dynamically generate the computation kernel to achieve best performance in all cases.*

Keywords: *DIC, GPU, OpenCL, optimal, kernel*

1. Introduction

Measurement of surface deformations is an important task of experimental solid mechanics. There are many techniques to achieve the results, both with and without contact. Most used contact method used is point-wise strain gauge technique, overview of available non-contact methods can be found in [1], [2] and [3]. DIC is a contact-less technique using a fixed camera to capture the stress test followed by digital image processing and numerical computing to compute full-field displacements and strains. Advantage of DIC is its simplicity of test setup - we only need single camera and no modification to tested material to obtain results with good quality. It should be also noted that DIC has wide range of measurement sensitivity and resolution, since its precision is based on camera used, not the algorithm itself. Disadvantage of the algorithm is that quality of results depends heavily on the quality of imaging system and the computation is slow compared to other techniques.

1.1. DIC fundamentals

In this chapter we will focus on fundamentals of digital image correlation algorithm. The complete description of DIC can be found in [4], we will provide only a broad description of algorithm.

The input data are comprised of single video file or sequence of images capturing the specimen during the stress test. In case the input data are in color (usually RGB), they need to be converted to gray-scale. The first step is to split the calculation area (i.e. region of interest) into evenly spaced grids on which the displacements will be computed. The next step is to track (or match) same points (pixels) between two images (typically before and after the deformation) as illustrated in Figure 1.

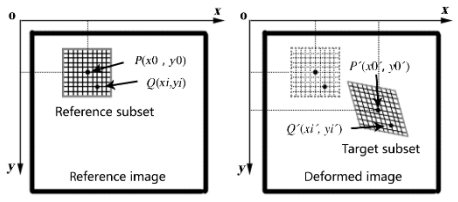

Figure 1 Deformation of a subset

Point matching

The displacement of a point P is computed using a square reference subset of $(2M + 1) * (2M + 1)$ pixels centered on P to track its corresponding location in the deformed image. The subset of points is important because it offers good protection against noise and allows to better distinguish the subset from other subsets in case of images with low gray level variations. The similarity is evaluated using correlation criterion (multiple criteria are available) and searching for peak position of the deformed subset. The difference between the position of subsets center before and after the deformation yields the in-plane displacement vector.

Subset deformation

Simplest deformation of subset is simple shift. This can be described by two real numbers - shift in x and y. In most cases however, the displacement is not equal in all points of subset. In that case we need to employ some kind of "shape" function to describe the subsets change in the deformed image (in Figure 1 we can see that point P has moved differently compared to point Q). There are multiple kinds of shape functions, each able to describe different kinds of deformations. The overview of the functions can be found in [4], for us it is sufficient to know that the shape function is a simple equation using pixels absolute position, its relative position to subsets centers and deformation coefficients co compute the new position.

Interpolation

Because the coefficient values in shape functions are real numbers, resulting positions of deformed subset's points can be located between pixels (i.e. sub-pixel location). In order to be able to evaluate similarity between original and deformed subset, we need to obtain deformed subset pixel intensities. For this, a certain sub-pixel interpolation scheme must be utilized. There are plenty of variants including bi-linear interpolation, bi-cubic interpolation and bi-quintic B-spline interpolation. The algorithms mentioned and plenty of others can be found in numerical computing books ([5]). It is highly recommended to utilize

some kind of higher order interpolation (e.g. bi-cubic spline interpolation) scheme to provide higher registration accuracy.

Correlation
As mentioned earlier, to evaluate similarity between original and deformed subset, some kind of correlation criterion needs to be employed. There are multiple classes of correlation criteria available, all of them can be found in [6]. This paper also present an important result, that all criteria all in fact numerically equal, so we can choose any criteria we want and we will achieve same precision.

1.2. Parallel computation
DIC algorithm is a good candidate for parallel computation. An overview of how one can achieve parallel computation can be found in [7]. The basic idea is that every subset solution can be independent from others, thus we can compute multiple solutions at once. The biggest issue with GPU approach is data transfer. The GPU's global memory is often too slow to deliver all the data required by all computation units. This can be partially solved by generating data on the computation unit, not beforehand. Deeper description of this approach can be seen in [8].

1.3. Motivation
While running the computation on GPU using OpenCL and generating data online can provide very good performance, the performance of the solution can vary a lot depending on hardware used. It is well known that solution that works well on NVIDIA GPUs can be quite slow on AMD cards and vice-versa. But OpenCL also allows the computation to be run on integrated GPUs and also CPU and its architectures are different from standard GPUs, thus the performance might be also bad.
One solution to this problem is to have multiple kernels, each one optimized for different conditions (computation device, input data configuration). The downside of this approach is the count of kernels we would need to create (using optimizations found in [7] and [8]. In worst case scenario we would end up with 72 different kernels - input data in form of array / image2d_t, ZNCC / ZNSSD / WZNSSD correlation criterion (W meaning weighed), 1D / 1.5D / 2D kernel, use of memory coalescing and lastly use of online data generation. While possible, it would be extremely difficult to create and maintain this code base.
We have noticed that source code differences between kernel types are not big so it could be possible to generate kernel types dynamically. The user (or some kind of computation driver) will provide a kernel type configuration (input data form, correlation criterion, kernel dimension and memory coalescing and online data generation usage) and a function will generate a valid OpenCL kernel source code.
With that in mind we have created a solution, which can generate valid OpenCL kernel given a configuration. Along with it we have created a test suite, which executes different kernel configurations with various input data configurations and measures the execution time.

2. Test setup
Input data configuration consist of two parameters - subset count and deformation count. As mentioned earlier, the deformation can be of different order, in out tests we have tested zero and first order. The subset size was set to 31 pixels. The counts of subsets and deformation we used can be seen in
Table 1.

Subset count	1	2	8	32
Zero order deformations	3	21	169	441
First order deformations	160	486		

Table 1 Input data configuration

The kernel generation is as a task of generative programming. We have created a base template, which can be seen in Listing 1. Each token (text surrounded with percent signs) is then replaced with valid OpenCL code according to kernel specification.

```
%INT%                    // interpolation function
%CORR-G%                 // gauss distribution function

kernel void DIC(%HEAD%)  // function header
{
  %INIT%          // id checks, memory init
  %DEF-C%         // prepare deformation coeffs
  %DEF-S%         // deform subset
  %CORR-M%        // compute mean
  %CORR-D%        // compute delta
  %CORR-C%        // compute correlation
  %S%             // store result
}
```

Listing 1 OpenCL kernel base file

OpenCL code itself is not enough to commence the computation. We also need a "host" code, which essentially launches and drives the computation. The host code must copy the data to the device and then launch the kernel with proper parameters. We have used Java and JogAmp's JOCL library ([9]) to access OpenCL functionality. The Java code is not universal as OpenCL code, we have created separate classes for 1D, 1.5D and 2D kernel launch. JOCL library offers CLMemory interface for all data that can be copied to GPU, so the data generation is also universal, because we only pass a list of CLMemory objects to JOCL function.

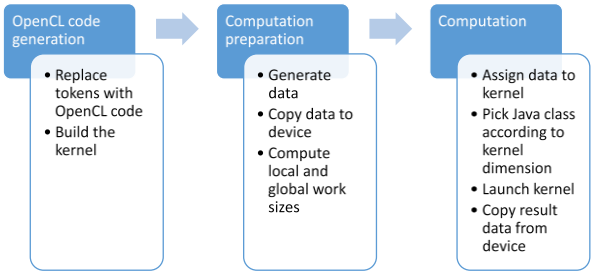

Figure 2 OpenCL dynamic kernel generaetion

To evaluate the performance of all kernels, we have measured the total time of execution, both host and device code. The execution time of device code is not enough to properly assess the performance of the kernel, because different configurations are launched a bit differently and the data generation in Java code is also different. In order to further improve the precision of the results, we launch a couple of kernels before the test in order to allow the device to initialize and load appropriate drivers.
As mentioned earlier, the performance of the kernel can vary a lot for different device, so we ran the test on multiple devices, the list follows:

- AMD Radeon HD 8750
- NVIDIA GeForce GT650M
- NVIDIA GeForce GTX765M
- Intel HD Graphics 4600 on HP ProBook 650
- Intel Core i7-3610QM

3. Results

The results will be presented in the form of graphs, where horizontal axis will enumerate input data configurations and vertical axis will denote execution time in milliseconds. The input data configurations will be described using a shortcut consisting of [subset count: deformation order - deformation count]. For example the configuration "02:Z:169" denotes a configurations with 2 subsets and 169 zero-order deformations. Each line in the graphs represents a kernel configurations. The kernel configurations are also described by a shortcut consisting of [kernel dimension; input data type; correlation criterion; memory coalescing; online data generation]. We will use AMD Radeon HD 8750M as a baseline and compare other results to this device.

3.1. Kernel dimension

First kernel parameter we have tested was kernel dimension. The dimension determines if we let OpenCL handle data indexing or if we provide some kind control using Java. Further details on kernel dimension can be found in [7].

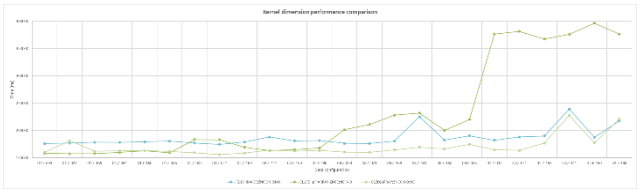

Figure 3 Kernel dimension performance comparison

Figure 3 presents comparison of best performing kernels for each dimension. The fastest is 2D kernel for almost all data configurations. The 1.5D kernel provides comparable performance as 2D kernel for data configurations with lower subset counts, but with higher subset counts the performance plummets. The 1D kernel's performance trend is same as for 2D kernel, but it is always 10% slower.

3.2. Best 2D kernel

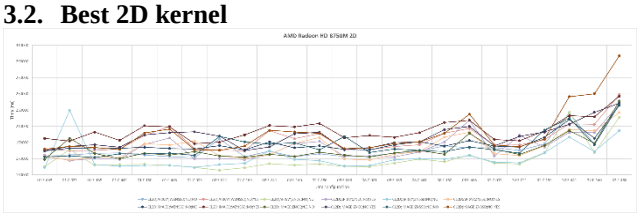

Figure 4 2D kernel comparison for AMD Radeon HD 8750M

Figure 4 presents full results for 2D kernels launched on AMD Radeon HD 8750M. The trends for all kernels are comparable, none of the kernels behaves differently when compared to others. The best kernels are the ones without memory coalescing and online data generation. In terms of correlation criterion, ZNCC is probably a bit better, but for larger data sets, it might be good to use ZNSSD. WZNSSD is always worse than other two options simply because the criterion is more complex and thus harder to compute.

3.3. NVIDIA GPU

While AMD GPU provides good performance for all data configurations, we are more interested if one kernel can provide good performance on other devices as well. We ran the same tests on NVIDIA GPUs, namely models Geforce GT 650M and Geforce GTX 765M. The results are presented if
Figure 5 and
Figure 6.

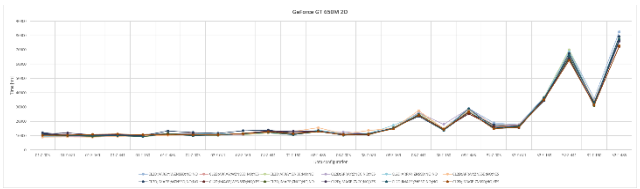

Figure 5 2D kernel comparison for NVIDIA GT 650M

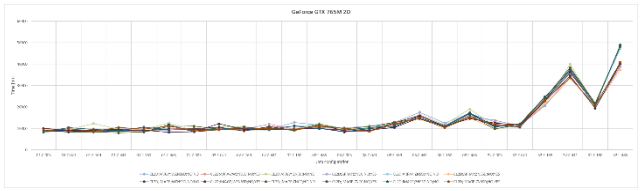

Figure 6 2D kernel comparison for NVIDIA GTX 765M

From the trend we can see that the performance of all kernels is almost the same. The absolute performance is much better in comparison with AMD card. The GeForce GT 650M card should be a little bit better than AMD Radeon 8750M in terms of performance, but in our test the GeForce cards dominated by factor of 10 or more in all cases. Only for larger data sets the AMD card's performance gets better. The absolute performance still isn't better, but the performance drop is smaller for AMD card than for NVIDIA cards.

3.4. Integrated GPU

The devices we have tested so far have all been dedicated graphic cards. A lot of user have laptop as main working station and usually they don't have dedicated graphics card, in most cases the graphics is handled by on-board Intel HD graphics card (or similar integrated solution from other vendors). These graphics cards have inherently different architecture and usually they don't have any dedicated video memory, they use system memory (RAM) instead. We ran out test on Intel HD 4600 (Haswell architecture) graphics card to see how it behaves.

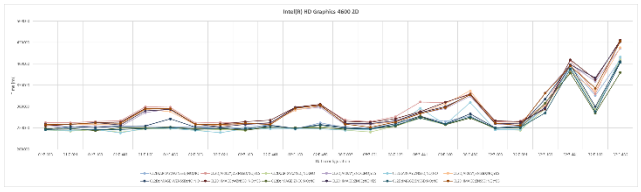

Figure 7 2D kernel comparison for Intel HD 4600

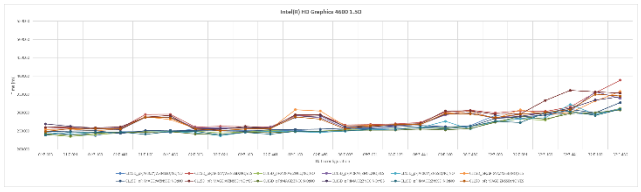

Figure 8 1.5D kernel comparison for Intel HD 4600

First surprise was that 2D kernel's (
Figure 7) performance was about 5% worse than performance of 1.5D kernel (
Figure 8). 1D kernel was at least 10% slower for smaller data sets and for larger one the 1D kernel was almost 2 times slower than 1.D kernel.
Figure 8 also show good performance even for larger data sets and for the biggest one (32 subsets with 486 first order deformations) the performance is almost the same as for AMD Radeon HD 8750M.

3.5. CPU

Last option to run OpenCL is to run it on CPU. CPUs generally are not good candidates for OpenCL computation due to different architecture, so we ran the test on Intel Core i7-3610QM CPU to see how it behaves.

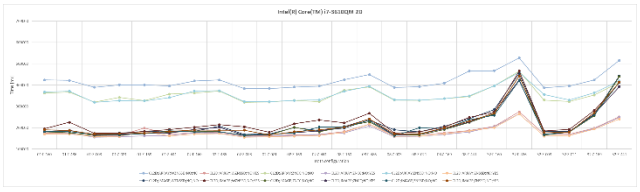

Figure 9 2D kernel comparison for Intel Core i7-3610QM

The CPU performs best with 2D kernel. For small input data configurations, the CPU outperforms the integrated GPU, for larger configurations the performance drops significantly and behaves much like dedicated GPUs.

4. Conclusions

During our tests we came to several conclusions. It is appropriate to use different kernel depending on used device. While 2D kernel offers good performance on all devices, on integrated GPUs it is good to use 1.5D kernel, because it handles larger data sets better.
Next we have compared all kernel configurations (input data type, use of memory coalescing and use of online data generation) in order to determine, if there is a best kernel for all correlation criteria and data configurations. For both dedicated and integrated GPUs, the best variant was without memory coalescing and without online data generation. The use of image as input data type isn't always an advantage, mainly for smaller data configurations the use of array proved to be better choice. For CPU, the use of online data generation showed significant performance improvement, in some cases up to 10%. The results confirm that the use of image as input data type is counter-productive. This due to the fact, that CPUs don't have dedicated pipeline for texture processing.
We also wanted to find out, if it is viable to use different kernels for different input data configurations. After inspecting all obtained results, we can conclude that it is not necessary to switch kernels. If we ignore the worst kernel configurations, we see that the performance trends of all configurations are comparable, so there is no need to use different kernel for different data configurations.
Our main focus and question was wherever it is beneficial to dynamically generate the kernel according to input data configuration and computation device. Dynamic kernel generation can provide best performance for all scenarios, even for new and unreleased devices, which support OpenCL. But dynamic kernel generation has also some drawbacks, such us as the lack of ability to use OpenCL code editor to check the code for errors before compilation and profilers for performance tuning. We can conclude that dynamic kernel generation, while being harder to create and maintain, is a good choice when performance is the main concern.

5. Acknowledgments
This work was supported by the Ministry of Education of the Czech Republic within the SGS project no. 21066/115 on the Technical University of Liberec.

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EXPLORING THE EFFECTIVENES OF OMEGAT IN TECHNICAL TRANSLATION

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Abstract: *The aim of this paper is to investigate the use of OmegaT in technical translation. Empirical research, consisting in the observations of students and pre- and post-study tests administered among Polish college students, was performed to assess the development of technical translation skills. The idea of integrating OmegaT into technical translation to achieve students' success in translation is explained in the article. The main argument is that this tool facilitate the process of translation.*

Keywords: *technical translation, machine translation, OmegaT in technical translation*

1. Introduction

Many scholars point out that new technologies opens up new horizons in translation (see for example Hutchins, 1999 or Carl and Way, 2003). However, they did not agree on what tool should be used.

The present article aims to present OmegaT as an effective tool for developing translation skills connected with technical issues among Polish college students. The choice of application was motivated by the desire to propose a free and professional tool to use in technical translation and to find out whether such application is effective.

Two groups of Polish students translate technical texts with the use of different approaches – one in a traditional manner, and the other with the help of OmegaT. The results of the students' pre- and post-tests as well as observations of their traslation show that OmegaT facilitate translation process and cause less errors than traditional translation.

2. Theoretical background

Literature shows that scholars are interested in the possible outcome of the incorporation of new technologies into translation. Most research studies have discussed strategies and guidelines for using such tools in the translation. However, little attention has been paid to how much translation users gain from using modern applications. Thus, this research aims at showing the results of incorporating OmegaT in technical translation among Polish college students.

2.1. Brief history of Machine Translation

The first idea of using computers in translation is attributed to Andrew Booth (1946) and Warren Weaver (1947). In 1950s and 1960s, there were three approaches to Machine Translation:

- direct translation model – programming rules were developed for one source language to one particular target language with only some analysis and syntactic reorganization;
- "interlingua" model – programming rules were developed in two stages: from source language to interlingua and from interlingua to target language;
- transfer approach model – programming rules were developed in three stages: analysis, transfer, and generation (synthesis).

In 1980s translators were becoming familiar with vendors of workstations, for instance, Trados, STAR AG, and IBM. In 1990s and 2000s many more were available: Atril, SDL, Xerox, Terminotix, MultiCorpora, MetaTexis, and ProMemoria. The mentioned tools were playable for the users. However, there are also free applications, for example, Wordfast Anywhere or OmegaT. After 1990s corpus-based approaches, rule-based approaches, speech translation, and hybrid systems were visible in translations.

2.2. Advantages of using Machine Translation

In many research papers, machine translation has been found beneficial. Some advantages include (see Bass, 1999 or Okpor, 2014):

- speed – translating the text with the use of machine translation is faster than human translation, for instance, Globalink claimed that their tools help to translate 61 200 words per hour whereas people in their traditional translation translate 650 words per hour;
- drop-dead consistency – translating the text with the use of machine translation helps to translate the same word in the same way without the risk of forgetting the exact word;
- cost – translating the text with the use of machine translation is cheaper than traditional people's translations.

Despite the fact that machine translation has a lot of advantages, human involvement should not be omitted.

2.3. OmegaT as a free and professional translation tool

For the purpose of the present research OmegaT was chosen as a free and professional tool for translation. The use of such tools is very easy since the users need to follow the steps through the assistant. The most important functions of such tool are:

- selection of language,
- segmentation of sentences,
- auto-propagation for automatic translation,

- removing tags,
- location of the saved folders.,
- glossary function,
- search function.

OmegaT supports the current Microsoft Office file formats and is compatible with XLIFF, ResX files, WiX Localization, Flash XML export, Wordfast TXML, or QuarkXPress CopyFlowGold. Moreover, OmegaT enables the users to use a machine translation, for instance, Google Translate, Belazar, Apertium, and Microsoft Translator, however they are independent tools and not all of them are free.

3. Methodology

This section describes the project that has been created to explore technical translation with the use of OmegaT. There were two groups of Polish college students who participated in the study and used different practices in translating technical issues.

The first group of Polish college learners used traditional methods in translation and the second group of Polish college students used OmegaT. The results of students' tests and observations indicate that the use of OmegaT facilitate the translations and cause less errors.

3.1. The goal of the project

The goal of the project was to bridge the gap between the use of OmegaT and technical translation among Polish college students. It is claimed that OmegaT gives the most freedom and power to the users. However, it would be useful to investigate whether such application lead to the development of students' translation skills connected with technical issues.

3.2. Participants

Two groups of Polish college students were selected to take part in this project. They were at the same level of English proficiency and they were selected randomly from all groups in the college. There were 60 learners altogether. The gender distribution was 62% males and 38% females.

3.3. Location

The research took place in Polish college in Sanok. There are not many studies conducted on the problem of technical translation and the use of OmegaT in Polish colleges. Thus, conducting a study in Polish college was aimed at bridging this gap in Polish literaure of the subject.

3.4. Design and procedure

Two groups of learners of Polish college participated in this project were randomly selected from all groups in the college. There were 30 students in each group and gender distribution was randomized. They were instructed by the same teacher. The project was one term long.

The first group of Polish college was named the Traditional Group. The students from this group translate technical texts with the use of traditional approach. They used traditional dictionaries while translating.

The second group of Polish college was named the Experimental Group. The students from this group translate technical texts with the use of OmegaT.

Before the project started, all students' results from technical translation tests (pre-tests) were analysed and the average number of points from all the tests was calculated. Then, the students were translate technical issues using different pedagogical approaches: the Traditional Group translate with the use of traditional methods, whereas the Experimental Group translate with the use of OmegaT. At the end of the project students took technical translation tests (post-tests). The tests' results were analysed and the average number of points from the tests was calculated. All the students were also observed and interviewed on the topic of methods employed in the translation processes.

3.5. Data analysis

The analysis of the data was conducted in two stages. Firstly, the average results of technical translation tests before the project for all groups were compared. Secondly, the avarage results of technical translation tests at the end of the project were compared. This was to assess any potential differences in the selection of translation tools between the Traditional Group and the Experimental Group. This was conducted with the use of Mann-Whitney's test to show whether the difference concerning technical translation skills between the groups was statistically significant and to determine whether the implementation of OmegaT is useful for technical translation.

The students from two groups made progress in translatin technical texts at the end of the project. Figure 1 presents the findings.

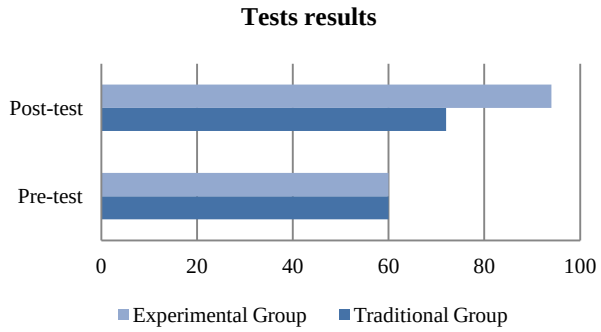

Figure 1. The distribution of points of the Traditional Group and the Experimental Group of Polish college students in tests results.

The data present a 22% difference between traditional translation and translation with the use of OmegaT among Polish college students connected with technical issues. According to Mann-Whitney's test, the difference in translation correctness between the Traditional Group and the Experimental Group at the end of the project was statistically significant (p-value <0,0001). OmegaT turned out to be more effective in technical translation. Moreover, the project boosted Traditional Group's and Experimental

Group's motivation to translate technical texts, enriched students' technical vocabulary, and developed their cooperation with peers. Figure 2 presents acquired lexical and grammatical translation skills at the beginning of the project and Figure 3 presents acquired lexical and grammatical translation skills at the end of the project.

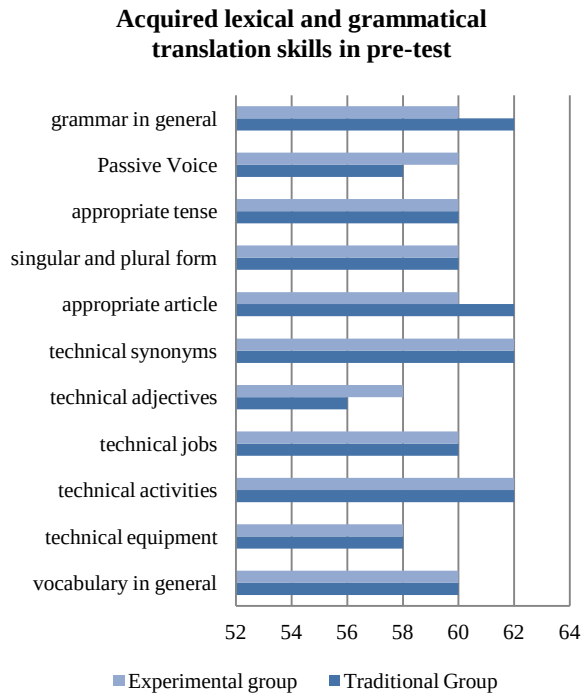

Figure 2. Acquired lexical and grammatical translation skills among the Traditional Group and the Experimental Group of Polish college students at the beginning of the project.

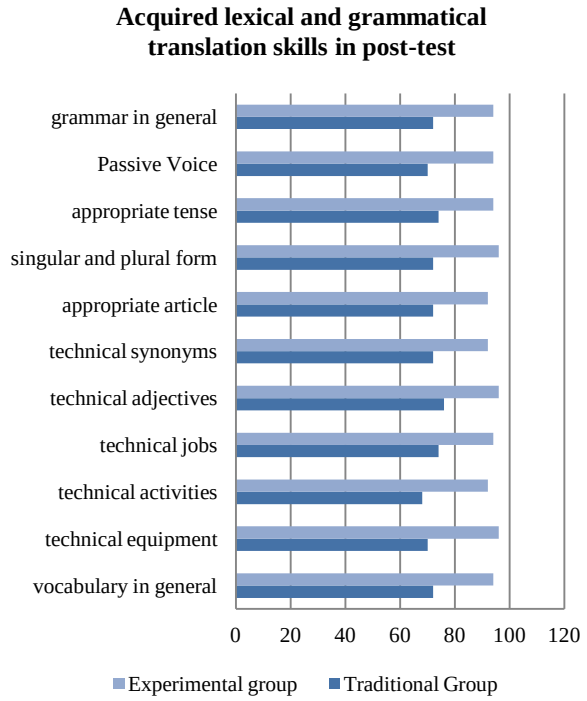

Figure 3. Acquired lexical and grammatical translation skills among the Traditional Group and the Experimental Group of Polish college students at the end of the project.

4. Conclusion

New technologies constitute significant support in translation. Teachers and translation instructors should be aware of the variety of translation applications available. OmegaT represents competitive modern technological solution for the students and translators. Such application enable the users to acquire its functions with pleasure and help them in the translation process. Moreover, it boosts confidence while working in groups on different translation projects.

The results of the present project show that OmegaT enhance students' technical translation. Texts translated with the use of OmegaT contained appropriate use of technical vocabulary and grammar structures as compared to the texts translated with the only use of traditional dictionaries. The great advantage of this application is the fact that it is free and it is really professional. The project was a success.

The findings allow for putting forward the hypothesis that other new technological tools that are free (e.g. Wordfast Anywhere) can also serve as a perfect tool in different types of translation and further research should be carried out in order to check it.

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Index of Author(s)

THE EFFICIENCY OF CADMIUM AND ZINC ACCUMULATION AND INFLUENCE ON NUTRIENT UPTAKE AND WATER STRESS IN *BRASSICA NAPUS* L.

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Abstract: *A hydroponic screening experiment was carried out to test phytoextraction ability and the effect of Zn supply on the response of Brassica napus L. on water stress. Plants were exposed to 5 μM cadmium ($CdCl_2$) and 10 μM zinc ($ZnSO_4$) and to induce drought stress, 4% polyethylene glycol (PEG) was added 48 hour before harvesting. Subsequently, nutrient uptake such as K^+, Na^+, Ca^{2+} and Mg^{2+} was determined. Cd significantly reduced root growth and shoot biomass. The highest concentrations of Cd and Zn were found in roots of all tested plants. PEG application decreased Zn uptake by roots and shoots while having no effect on Cd uptake. Similarly, PEG application had no visible effect on nutrient uptake. The concentration of Na^+ and Mg^{2+} was slightly higher whereas K^+ uptake was reduced in shoots of Cd treated plants. Reduction of Ca^{2+} concentration was observed in Zn treated plants.*

Keywords: *cadmium, Brassica napus, polyethylene glycol, zinc*

1. Introduction

Heavy metal contamination is an increasing worldwide problem caused by industrial, agricultural and urban activities [1]. Trace elements in the soils are easy available to plants which results in their excessive uptake into plant aboveground tissues and influences the yield production and quality. Cadmium (Cd) is one of the most toxic pollutant uptaken by crop plants and thus it causes serious problems to human health [2]. Although zinc (Zn) belongs to common environmental pollutant too, in small amounts represents an essential micronutrient which can influence water use efficiency by plants [3], [4].

Phytoremediation is an effective, inexpensive and environmentally friendly technology using capacity of some plants to uptake metals from polluted soil and water and accumulate them in their tissues [5]. Hyperaccumulator plants are tolerant to the metals they accumulate and usually show higher metal content in the shoots than in the roots (shoot/root metal concentration ratio >1). Some members of family Brassicaceae are known to accumulate high levels of heavy metals into their shoots. One of the most studied plants of Brassicaceae is *Brassica napus* L., economically important oilseed plant with all ideal criteria for phytoremediation such as fast and easy growth, high biomass production and considerable tolerance to some heavy metals such as Cd, Zn and Pb [6].

However, in the field, plants have to cope with mixture of different abiotic and biotic stresses. Although these stresses may occur together, they have been generally examined separately and there has been very little evidence on how they may interact. For example, it has been demonstrated, that elevating levels of Zn resulted in increase in growth and also in partly tolerance to drought stress [4].

The aim of the present study was to investigate the phytoextraction potential of *B. napus* and possible interaction between water stress and Zn nutrition with a focus on the plant´s metal and nutrient accumulation.

2. Material and methods

Seeds of oilseed rape (*Brassica napus* L.) cv. Cadeli were obtained from the Crop Research Institute of the Czech Republic. Plants were grown hydroponically for 14 days in a modified 1/10 Hoagland medium with pH 5.7. Four independent experiments with two sets of plants were tested. Plants in the first set were grown in a medium with addition of 5 μM $CdCl_2$ (5Cd) or 10 μM $ZnSO_4$ (10Zn). The second set of plants was grown in the same conditions, but 48 hours before harvesting, 4% PEG 6000 was added. Polyethylene glycol (PEG) is a polymer which can be used to modify the osmotic potential of nutrient solution and thus induce plant water deficit in a relatively controlled manner [7]. After 14 days, plants were harvested, weighted, dried, wet digested and used for elemental profiling using ICP-OES.

3. Results

3.1 Effect of Cd and Zn accumulation on plant growth

In preliminary experiments, we tested different Cd concentrations to find suitable Cd treatment which will reduce the root length by 50%. The following concentrations were tested: 5 μM and 10 μM $CdCl_2$. The required reduction of root growth was seen at 5 μM Cd (Figure 1), therefore we used this concentration for the following experiments.

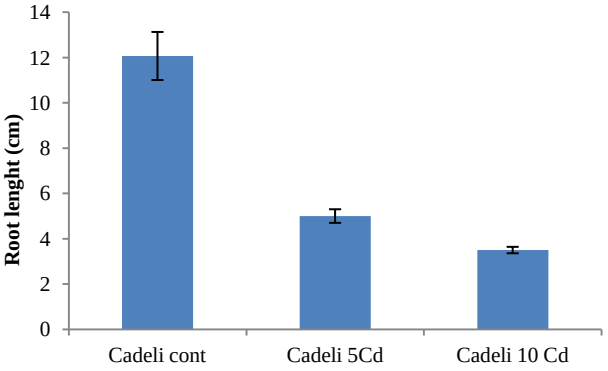

Figure 1: Root length of B. napus cv. Cadeli grown in control medium (cont) and in medium with 5 µM Cd (5Cd) or 10 µM Cd (10 Cd). Mean values (n = 3); bars represent standard errors.

We observed a good correlation between the appearance of visual symptoms of metal toxicity and a root and shoot growth inhibition. Except for plants grown in a medium with Cd, no chlorosis was visually observed during the treatment. Plants growth characteristics including fresh root and shoot weight and root lengths are shown in Table 1. The fresh shoot weight and root length decreased in Cd treated plants compared to the control and Zn treated plants. The application of PEG had no significant effect on the plant growth characteristics.

Table 1: Changes in root length (cm), root and shoot weight (mg) of B. napus grown with or without Cd, Zn or PEG. Data are means± SD (n = 3). Values within column, followed by the same letter(s), are not significantly different according to Tukey's test (P<0.05).

Treatment	*Root length*	*Root weight*	*Shoot weight*
Cont	14.57±4.78A	45.92±16.13A	468.58±211.44AB
5Cd	3.74±0.65B	16.5±1.44A	163.42±35.67B
10Zn	13.4±2.63A	36.67±10.23A	346.25±95.02AB
Cont+PEG	13.37±4.48A	28.67±13.70A	476.89±152.14A
5Cd+PEG	4.96±1.46B	20.78±8.14A	201.69±57.12B
10Zn+PEG	15.75±1.72A	24.89±3.60A	444.33±70.85A

3.2 Uptake and translocation of Cd and Zn

The Cd and Zn accumulation in *B. napus* is shown in Figure 2. As expected, the content of heavy metals in plants increased after their addition into the medium. Rape plants retain much more Cd and Zn in their roots then it was translocated into the shoots. The addition of PEG caused lower uptake only in Zn, but the translocation into the shoots was affected in both, Cd and Zn treatments.

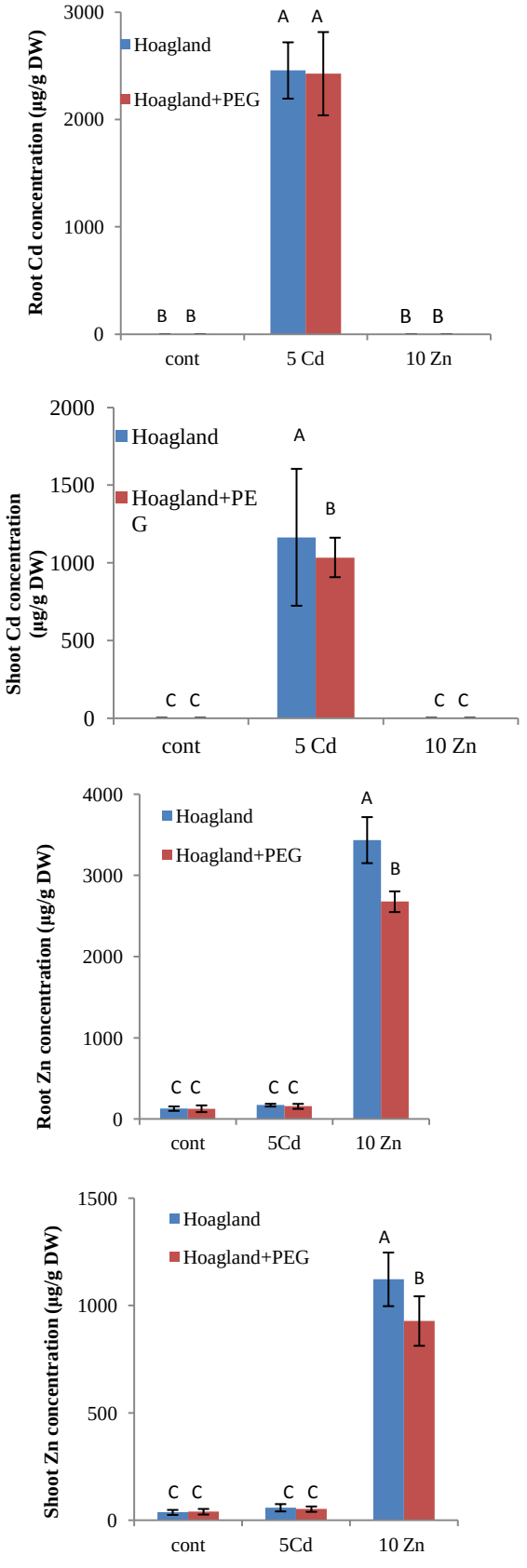

Figure 2: Content of Cd and Zn in root and shoot of B. napus grown with or without Cd, Zn or PEG. Data are mean ± SD (n = 3); bars represent standard errors. Results of statistics are as in Table 1.

3.3 Effect of Cd and Zn on uptake and translocation of Na^+, K^+, Mg^{2+} and Ca^{2+}

The uptake of selected mineral nutrient is shown in Table 2. Na^+ concentrations in roots and shoots were significantly higher in Cd treatment. PEG application resulted in slight enhancement of accumulation in control and Zn variants for both, roots and shoots.

K^+ concentration in the roots was slightly reduced in Zn variant and PEG treatment had no effect. On the other hand, quite sharp increase in K^+ content was shown in the shoots treated with Zn in both sets of plants. The Cd treatment resulted in considerable decrease in variants with as well as without PEG.

Higher contents of Mg^{2+} were observed in shoots compare to roots which were unaffected with any treatment. Cd treatment resulted in slight increase of Mg^{2+} content in shoots compare to control or Zn treatment and it was the same for PEG application.

Considerably higher concentration of Ca^{2+} was noted in the shoots and its content was increased by the Cd addition for both sets of plants. Zn addition resulted in significant reduction. Similar trend was monitored for roots.

Table 2: Content of Na^+, K^+, Mg^{2+} and Ca^{2+} (mg.g^{-1} d.w.) in root and shoot of B. napus grown with or without Cd, Zn or PEG. Data are mean ± SD (n = 3). Results of statistics are as in Table 1.

	Nutrient concentration (mg.g^{-1} d.w.)			
	Na^+	*K^+*	*Mg^{2+}*	*Ca^{2+}*
root				
Cont	0.95±0.25B	20.97±2.70AB	1.51±0.51A	4.56±0.61B
5Cd	4.03±1.67A	25.72±3.92AB	1.82±0.26A	6.94±0.78A
10Zn	1.37±0.69AB	19.52±3.96B	1.65±0.24A	5.77±0.96AB
Cont+PEG	2.16±1.42AB	29.03±4.00AB	1.27±0.26A	4.87±0.41B
5Cd+PEG	1.76±0.47AB	29.16±1.67A	1.50±0.72A	5.52±0.37AB
10Zn+PEG	2.17±1.10AB	29.68±4.13A	1.37±0.28A	4.70±0.92B
shoot				
Cont	0.24±0.09C	61.02±3.36BC	6.99±0.23C	31.93±2.43B
5Cd	0.89±0.32A	44.07±7.61CD	8.49±1.70A	32.66±4.77A
10Zn	0.40±0.22C	69.02±3.84A	6.15±0.54D	22.22±2.67D
Cont+PEG	0.54±0.18B	51.35±8.48D	5.90±0.71D	28.52±3.94C
5Cd+PEG	1.00±0.33A	42.21±4.21D	7.84±0.38B	30.54±1.12C
10Zn+PEG	0.56±0.20B	60.19±7.08AB	4.93±0.79E	18.53±2.86D

4. Discussion

Cadmium is a trace element with no physiological function in plants or humans. Our study demonstrates significant changes in plant growth characteristics in hydroponic culture with Cd treatment. Cd exposure also produced visual symptoms of metal toxicity such as chlorosis. The same growth and biomass reduction in response to Cd stress was also reported for *Hordeum vulgare* [8], *Brassica napus* [9], *Brassica juncea* [10], *Helianthus annuus* [11] or for *Solanum lycopersicum* [12]. Since Zn plays a growth promoting role at lower concentrations [3], no changes in root growth and shoot biomass accumulation were observed in Zn treated plants. Application of PEG had no significant effect on plant growth.

Cd and Zn accumulation in the root was higher than in the shoots which does not fulfil the conditions for phytoextraction potential of *B. napus* plants. This finding is consistent with results of [13] or [14]. On the other hand it must be emphasized that the phytoextraction performance strongly depends on the screening method and, most importantly, on the plant capacity to tolerate high soil metal concentration while keeping fast biomass accumulation, as reported by [6].

Interestingly, Zn uptake was negatively affected by application of PEG. Values of root and shoot Zn accumulation significantly decreased after PEG addition which suggests that drought has negative effect on plant Zn uptake during the water stress. Similar results were reported by [8]. They found that high Zn accumulation by barley plants resulted in a significant decrease in water content.

The nutrient composition was altered by Cd and Zn treatment which is associated with heavy metal toxicity to plants. Na^+ root concentration increased in Cd treated plants but not in these treated also with PEG. In shoots the similar results were obtained, but Na^+ content was higher in PEG treated plants too. Since Na^+ helps to regulate water balance it may be essential for plants to have higher concentrations of Na^+ during heavy metal stress but not during drought stress. However, extremely little is known about mechanisms required for monitoring Na^+ concentrations in plants.

Potassium is one of the most important macronutrient for plant growth and development with effect on the activity of many different enzymes [15]. K^+ concentrations in the roots were not affected by any treatment. Interestingly, shoot K^+ concentration decreased in Cd treated plants. This suggests that uptake of K^+ was not affected due to Cd presence in the growth medium, however, its translocation to the shoot was inhibited. Importance of presence of K^+ in the growth medium is reported by [16] who suggests that application of K^+ is highly effective protection towards the Cd toxicity.

Magnesium is a divalent cation that is a part of the chlorophyll molecule and also plays crucial role in photosynthesis in plants. Mg^{2+} uptake by roots was not affected by any treatment. Values of Mg^{2+} concentration in shoots were higher than in the roots which suggests, that Mg^{2+} is preferentially translocated to the shoots. Slight increase was observed only in shoots of Cd treated plants that corresponds with finding of [17]. They showed that shoot Mg^{2+} concentration was higher than root Mg^{2+} concentration and that Mg^{2+} may enhance plant growth and protect plants suffering from Cd toxicity.

Calcium is an essential plant nutrient required for integrity of cell wall and membranes with important role in cytosol

as an intracellular messenger [18]. Ca^{2+} concentrations decreased significantly in shoots of Zn treated plants in both sets. Similar as for K^+, uptake of Ca^{2+} was not affected by Zn in growth medium, but the translocation to the shoot was limited. Ca^{2+} enters plant cell trough Ca^{2+} permeable ion channels in the plasmatic membrane [19] which are permeable to many divalent cations such as Mg^{2+}, Cd^{2+} or Zn^{2+}. Thus there might be competition between Ca^{2+} and Zn^{2+} in their transport to the shoot.

5. Conclusion

The aim of this study was to evaluate the phytoextraction potential of *B. napus* L. and the possible interaction between drought stress (PEG) and Zn nutrition in *B. napus* plants. PEG application had no effect on plant growth, whereas Cd treatment significantly reduced plant growth with the same pattern for PEG. Root heavy metal uptake was greater than shoot heavy metal uptake on both Cd and Zn treated plants. In PEG treated plants, lower uptake of Zn was found. Nutrient uptake and translocation to shoot was disturbed both in Cd and Zn treated plants with similar pattern for PEG. Whereas root Na^+ uptake increased during Cd treatment, K^+ and Ca^{2+} uptake by shoot decreased in Cd and Zn treatment, respectively.

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POPULATION SIZE AND DISPERSION OF POPULATION OF SNOWDROP IN TWO DECIDUOUS FORESTS IN SOUTH-WEST SLOVAKIA

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Abstract: *The field work was performed on a cenopopulation of Galanthus nivalis L. It is a bulbous ephemeroid geophyte of the family Amaryllidaceae, naturally inhabit humid places that may be flooded for short periods. It is rare type of plant of clonal growth in Central Europe with the belowground organ, bulb, it occurs in deciduous forests, especially in floodplain forests, scrub and meadows from lowlands to mountains. Research was conducted in Báb forest, located in south-west of Slovakia, in two forest communities (Carici pilosae-Carpinetum betuli and Primulo veris-Carpinetum betuli) in March 2015. For estimation of population density, dispersion of population and frequency of cenopopulation of flowering plants we used standard line-transect method. Transect was 100 m long and 1 m wide. Non-destructive method was used. Number of flowering individuals varied from 1 to 231 i.m^{-2}. Population density of flowering plants was higher in Carici pilosae-Carpinetum community at all. Dispersion index of population according to aggregation coefficient in both of forest communities was confirmed by aggregated dispersion, which represents clumped population. These data shows, that Báb forest has better conditions for growth for Galanthus nivalis L. in Carici pilosae-Carpinetum betuli.*

Keywords: *Galanthus nivalis, dispersion of population, population size, deciduous forest, Báb*

1. Introduction

Galanthus nivalis L. – is one of the earliest flowering bulbs in European gardens, growing up to 15–20 cm height with normally one nodding milky white bell flower, early spring species appearing between January and March. It is a bulbous ephemeroid geophyte of the family *Amaryllidaceae* [1]. It is a highly decorative, good honey bearing and perspective medicinal plant, which contains a number of alakaloids, the most valuable of them being galantamin and nivalidin [2, 11]. Spring geophyte represents in forest communities a specific functional group of plants. Coupled with the summer synusia species we consider them as temporal guilds, because these herbs used different quantity and quality of resources during the year [3, 4]. Plants of *Galanthus nivalis* naturally inhabit humid places that may be flooded for short periods [10]. The plant is being and indicator of humidity and impermeability of the soils [2]. Its populations can survive below zero degrees (-10 ºC) during winter. *Galanthus* spp., in particular, has attracted attention for their potential in treating Alzheimer's disease [10]. *Galanthus nivalis* is rare type of plant of clonal growth in Central Europe with the belowground organ, bulb [11]. Plant occurs in deciduous forests, especially in floodplain forests, scrub and meadows from lowlands to mountains. Often it is grown as one of the first spring flowers in gardens [17]. Since 2003 is not protected in Slovakia, with the obvious exception of national parks and protected area. In neighboring countries, the common is snowdrop protected.

2. Material and Methods

The field work was performed on cenopopulation of Galanthus nivalis L. in two deciduous forests in Báb forest in March 2015.

2.1 Study area

The study was conducted in Báb forest, located in south-west of Slovakia. Administratively, the Báb forest area belongs to cadastre of village Veľký Báb, district Nitra and to Nitra Region. It is situated on Nitra loess upland, 19 km from Nitra and 15 km from Sereď. Two reserve areas can be found here – National Nature Reserve Báb forest and the Protected Area Báb Park. This forest is remnant of original native forest complexes. Its total area is 66 ha. In the past, it was marked by anthropogenic impacts especially short rotation management. Its surroundings were mainly turned into wide-area fields and vineyards [12]. The Báb forest represents a climax stage of forest succession on loess [5].

Research of cenopopulation of *Galanthus nivalis* L. was carried out in two deciduous forest communities, that are in the associations *Carici pilosae-Carpinetum betuli* Neuhäusl, Neuhäuslová-Novotná, 1964 and *Primulo veris-Carpinetum betuli* Neuhäusl et Neuhäuslová-Novotná, 1963 [12] included. Slovakia was chosen, in a global network of study areas IBP, as a representative ecosystem of oak-hornbeam forest in the loess upland. Institute of Landscape Ecology of the Slovak Academy of Sciences (ILE SAS) initiated establishment of the national network LTER Slovakia and established own LTER site – Báb [8].

2.2 Line transect method

For estimation of population density, dispersion of population and frequency of cenopopulation of flowering plants we used standard line-transect method (figure 1). Length of transect was 100 m, 1 m wide, where were 100 quadrats in two forest communities (*Carici pilosae-Carpinetum betuli*, *Primulo veris-Carpinetum betuli*). Plot sites 1x1 m (*basic plots* N = 100) along the line-transect, were divided into 4 parts: 0.5 x 0.5 m (*small plots* N =

400). For this part of research we used non-destructive method, just counting of flowering individuals of *Galanthus nivalis* L. It belongs to protected area.

Figure 1: Picture of line-transect method

The population density and frequency of population of flowering plants was determined on the line transect in two ways: in the occupied quadrats and across whole line-transect for both of plots (*basic* and *small plots*).

The population density was determined as the number of individuals per m^2 from across line-transect area, respectively, as the number of individuals per m^2 of surface squares.

The frequency of population of flowering plants we calculated as follow:

$$Fr\ [\%] = (n_1/N) \times 100$$

n_1 - number of sites where it was observed the presence of the species,
N - number of monitored sites

The dispersion index of population of flowering plants was identified by quadrat method from quadrat across the line-transect. For population was calculated the rate of aggregation (quadratic method) for *basic* and *small plots*:

$$k = V/x$$

V- variance
x- average number of species in quadrat

The aggregation coefficient indicates population of spatial structure as follow:

k = 1 – uniform dispersion
k > 1 – aggregated dispersion
k < 1 – random dispersion

3. Results and discussion

In conditions of Báb forest in two different communities with cenopopulation of snowdrop blossoming in March 2015, the presence of flowering individuals in both of forest communities was found out. Number of flowering individuals varied from 1 to 231 $i.m^{-2}$. In Báb forest was *Galanthus nivalis* identified in 3 plot sites with 8 – 148 individuals per $1m^2$ [9]. Number of flowering plants in forest community *Carici pilosae-Carpinetum betuli* dominated with total flowering plants 701, in *Primulo veris-Carpinetum betuli* community were only 11 flowering plants found, on 4 *basic plots*. Before 40 years ago, there was conducted a synecology research under the International Biological Program (IBP) and the 'Man and Biosphere' (MaB) program, where was present of *Galanthus nivalis* L found out [13] in forest community *Carici pilosae-Carpinetum betuli*. In recent years many autors dealed about the research of snowdrops and other spring geophytes in the Báb forest [7, 9, 14].
Population density of flowering plants in 2015 was higher in *Carici pilosae-Carpinetum* community at all, with 7 $i.m^{-2}$ in *basic plots* and 1.7525 $i.m^{-2}$ in *small plots*, when just occupied quadrats (*basic* and *small plots*) were taken into account population density values were even higher (table 1).

Table 1 Population density ($i.m^{-2}$) of flowering plants of Galanthus nivalis along the transect in two forest communities

	Whole transect		*Occupied quadrats only*	
	Basic plots	*Small plots*	*Basic plots*	*Small plots*
Carici pilosae-Carpinetum betuli	7.01	1.7525	31.9	11.49
Primulo veris-Carpinetum betuli	0.11	0.0275	2.75	2.75

In research frequency of spring geophytes cenopopulation [6], the highest 100 % *Anemona ranunculoides*, *Corydalis solida*, 89 % *Ficaria bulbifera*, 75 % *Gagea lutea*, 40 % *Isopyrum thalictroides*, 12 % *Dentaria bulbifera*, 1 % *Corydalis cava*. Frequency of flowering individuals of *Galanthus nivalis* in *Carici pilosae-Carpinetum betuli* it is moderate-low 22 % in *basic plots* and about 15 % for *small plots*, for *Primulo veris-Carpinetum betuli* it is extremely low frequency 4 % *basic plots*, 1 % *small plots* (table 2).

Table 2 Frequency (%) of flowering individuals of Galanthus nivalis

	Whole transect	
	Basic plots	*Small plots*
Carici pilosae-Carpinetum betuli	22	15.25
Primulo veris-Carpinetum betuli	4	1

Dispersion index of population according to aggregation coefficient in both of forest communities was confirmed by aggregated dispersion, which represents clumped population (table 3). In plant distribution over the cenosis, plants with vegetative reproduction it is aggregated in more or less distinct groups and *Galanthus nivalis* cenopopulation creates dense and compact clones [15]. This argument is also supported by other observation [9], which was seen similar pattern in 4 microgroups located in oak-hornbeam forest.

Table 3 Dispersion of population of flowering plants of Galanthus nivalis according to aggregation coefficient in two forest communities

	Dispersion of population (k)	
	Basic plots	*Small plots*
Carici pilosae-Carpinetum betuli	367.32	1469.3
Primulo veris-Carpinetum betuli	33.522	134.1

These data shows, that in Báb forest has better conditions for growth for *Galanthus nivalis* L. in *Carici pilosae-Carpinetum betuli* community than in *Primulo veris-Carpinetum betuli*. The florsitic composition of the nautral and semi-natural oak-hornbeam forests (*Carici pilose-Carpinetum betuli*) is typical by a high abundance of spring geophytes, while *Primula veris-Carpinetum betuli* is distinguished by the presence of thermophilous species and species occuring intermittently moist sites [18].

4. Conclusion

Assesment of population structure of spring geophyte *Galanthus nivalis* were found numerous cenopopulations in *Carici pilosae-Carpinetum betuli* with higher population density and more flowering individuals along the line-transect than in *Primulo veris-Carpinetum betuli.*

Spatial dispersion of population was confirmed by index of dispersion, where clumped population was found. Research does not deal about vegetative individuals of snowdrop, what means, that population of *Galanthus nivalis* in both deciduous forests are higher than is estimated in this paper. Attention for vegetative individuals not only for generative we will focus on other research.

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BIOACCUMULATION OF IRON, ZINC, COPPER AND LEAD IN HONEY BEES, BEE POLLEN AND HONEYCOMB

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Abstract: *Heavy metal pollution has become a major problem in many countries, because of their presence in drinking and waste water often exceeds the permitted standards. Subsequently are contaminated soil and aboveground biomass. Some of the metal ions in the natural environment pass through the food chain. They are accumulated in the tissues of animals, as well as human body. Contamination of food raw material by heavy metals can significantly affect human health. In this research, we focused on the determination of iron, zinc, copper and lead in honey bees, bee pollen and honeycomb from two localities (Košice, Rozhanovce) of Eastern Slovakia. The tested bees and their products were collected from apiaries located in the area of the University of Veterinary Medicine and Pharmacy in Košice and the apiary in Rozhanovce. Homogenised samples were mineralized. We used microwave digestion unit MARS X-press. The end of determination was analysed by using atomic absorption spectrometer VARIAN AA 240 Z with GTA120 graphite furnace. The obtained results were statistically evaluated by program STATGRAPHICS Plus 5.1. The contaminated bee pollen and honeycomb poses not only a risk of iron entry into the food chain but also cause a danger for human health. Statistically significant relationship was confirmed between the locality and content of zinc, copper and lead in bee pollen.*

Keywords: *honey bee, bee pollen, honeycomb, heavy metals, contamination*

1. Introduction

To the end of the fifties of last century, Slovakia was more agrarian country with small industrial site, which formed closed ecological units. Subsequently began to build heavy industry. Industrialization meant a great impact on natural resources and the need to build a large energy systems usually without perfect separation technology. There has been contamination of the components of the environment. Agricultural use of chemicals in many cases left on the country a negative effect. This created problem areas where it is disturbed quality of air, water and soil. These components consequently affect local flora and fauna. These areas are old environmental burdens that create a threat to the future. There are not a large territories but living there nearly a third of our population, often without knowledge of what risks constitute those areas for their health. In eastern part of Slovakia has been defined the burdened areas by size of territory and population. They are territories: Jelšava-Ľubeník Rudňany-Gelnica, Košice-Prešov and Zemplín [1].

Human activities have become a determining factor in the changed conditions of biogenic elements in the natural environment, and the accumulation of substances that naturally did not occur previously. We are called foreign substances, because they are not part of abiotic or biotic components of the environment. An important characteristic of these substances is persistence of contaminants (transformation in the environment) and accumulation in biological systems. During accumulation of contaminants has an important role adipose tissue with the ability to accumulate fat-soluble substances [2].

Nowadays modern medicine focused on the use of natural products. The main argument for the deployment natural products in the therapy are low cost of treatment and the absence of antibiotic resistance. Bee products as a potential source of microbial active substances and their use in medicine as a drug or a means of promoting the healing of chronic wounds infected by resistant microorganisms is a growing interest [3].

Honey bees are responsible for more than half of the pollination across the world, hence they have an important role in agriculture. In recent years, the number of honey bees have declined due to the Colony Collapse Disorder (CCD), which may be due to possible causes that include climate change and pollution. Since honey bees start from their hives to go for pollination, their activities around the hive are a good indicator of their health [4, 5, 6].

Bee pollen has gained reputation as an important source of energy and beneficial substances from the nutritional and health points of view. However, in the recent years this natural product has gained much interest, either from the scientific community, increasing the number of works about it, or from the general population, that buy it as natural functional food. This review intends on one hand to focus on the chemical composition of the bee pollen, since it is the chemical components that provide it with beneficial properties. On the other hand, it also addresses the health effects of this product, by referring the different studies that have been published [7, 8].

Important fatty acids counterparts in the diet are the ω-3 fatty acid α-linolenic acid (ALA) and the ω-6 fatty acid linoleic acid (LA). The optimal ratio of unsaturated fatty acids (ω-6) : (ω-3) in the diet is thought to be 1 : 2, but in modern diet, however, this ratio is in unbalance (1: 15–20). Bee pollen and beebread (honeycomb) are a source which partly could restore this unbalance [9, 10].

2. Material and Methods

The tested bees and their products were collected from apiaries located in the area of the University of Veterinary Medicine and Pharmacy in Košice and the apiary in Rozhanovce. The samples were treted by 10 cm^3 of aqua regia (2.5 cm^3 HNO_3 and 7.5 cm^3 HCl) using microwave digestion unit Mars X-press 5 (CEM Corp., USA). The mineralization was carried out in teflon vessels at elevated temperature. The concentrations of metals were measured using atomic absorption spectrometry (AAS) in a Varian AA 240 Z (Varian, Australia) with GTA120 graphite furnace. Statistical analyses were performed using descriptive data analysis. The significance of each variable was verified by LSD test. We used Pearson correlation coefficients at significance level of $p<0.05$ (weak statistical significance) and $p<0.01$ (very strong statistical significance) available at STATGRAPHICS 5.1.

3. Results and Discussion

The content of iron in honey bees from apiary in Košice varied over a value 146.90±12.40 $mg.kg^{-1}$ of dry matter (DM). Iron content in bee pollen was 133.80±9.10 $mg.kg^{-1}$ (was about 1.10 times smaller compared to honey bees) and in honeycomb was 182.00±13.70 $mg.kg^{-1}$ (was about 1.24 times higher compared to honey bees) of DM. The iron content in honey bees from apiary in Rozhanovce varied over a value 110.20±8.30 $mg.kg^{-1}$ of DM. The content of iron in bee pollen was 100.70±7.70 $mg.kg^{-1}$ (was about 1.09 times smaller compared to honey bees) and in honeycomb was 57.50±10.70 $mg.kg^{-1}$ of DM (was about 1.92 times smaller compared to honey bees). Results are shown in the figure 1.

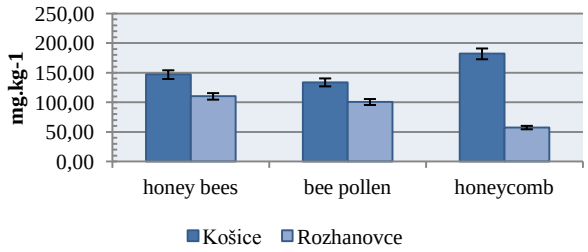

Figure 1: The evaluation of Fe content in honey bees, bee pollen and honeycomb

Very strong statistical significance of the correlations of iron content is between all evaluated parameters, but only between content of iron in honey bees and locality is weak statistical significance of correlations (table 1).

Table 1 Statistical analysis of Fe content in honey bees and their products and their relationship to the locality

	Locality	*Honey bees*	*Bee pollen*	*Honeycomb*
Locality		-0,9052*	-0,9233**	-0,9873**
Honey bees	-0,9052*		+0,9980**	+0,9611**
Bee pollen	-0,9233**	+0,9980**		+0,9726**
Honeycomb	-0,9873**	+0,9611**	+0,9726**	

* weak statistical significance of the correlations ($p<0.05$)
** very strong statistical significance of the correlations ($p<0.01$)

The content of zinc in honey bees from apiary in Košice varied over a value 56.40±6.70 $mg.kg^{-1}$ of dry matter. Zinc content in bee pollen was 14.50±2.70 $mg.kg^{-1}$ (was about 3.89 times smaller compared to honey bees) and in honeycomb was 21.80±1.70 $mg.kg^{-1}$ (was about 2.59 times smaller compared to honey bees) of DM. The zinc content in honey bees from apiary in Rozhanovce varied over a value 152.40±11.70 $mg.kg^{-1}$ of DM. The content of zinc in bee pollen was 20.40±1.70 $mg.kg^{-1}$ (was about 7.47 times smaller compared to honey bees) and in honeycomb was 18.20±3.30 $mg.kg^{-1}$ of DM (was about 8.37 times smaller compared to honey bees). Results are shown in the figure 2.

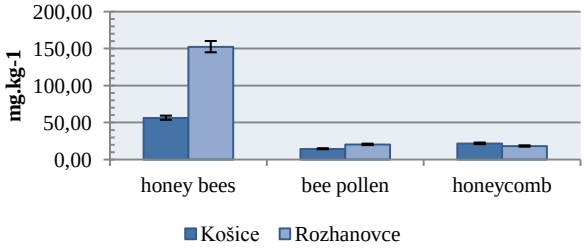

Figure 2: The evaluation of Zn content in honey bees, bee pollen and honeycomb

Very strong statistical significance of the correlations is between content of zinc in honey bees and locality, and between content of zinc in bee pollen and in honey bees and locality is weak statistical significance of correlations (table 2).

Table 2 Statistical analysis of Zn content in honey bees and their products and their relationship to the locality

	Locality	*Honey bees*	*Bee pollen*	*Honeycomb*
Locality		+0,9871**	+0,8482*	-0,6431
Honey bees	+0,9871**		+0,9121*	-0,5124
Bee pollen	+0,8482*	+0,9121*		-0,1962
Honeycomb	-0,6431	-0,5124	-0,1962	

* weak statistical significance of the correlations ($p<0.05$)
** very strong statistical significance of the correlations ($p<0.01$)

The content of copper in honey bees from apiary in Košice varied over a value 22.00±3.20 $mg.kg^{-1}$ of dry matter. Copper content in bee pollen was 4.90±0.40 $mg.kg^{-1}$ (was about 4.49 times smaller compared to honey bees) and in honeycomb was 4.30±0.60 $mg.kg^{-1}$ (was about 5.12 times smaller compared to honey bees) of DM. The copper content in honey bees from apiary in Rozhanovce varied over a value 22.00±1.70 $mg.kg^{-1}$ of DM. The content of copper in bee pollen was 7.10±0.50 $mg.kg^{-1}$ (was about 3.09 times smaller compared to honey bees) and in honeycomb was 3.90±0.30 $mg.kg^{-1}$ of DM (was about 5.64 times smaller compared to honey bees). Results are shown in the figure 3.

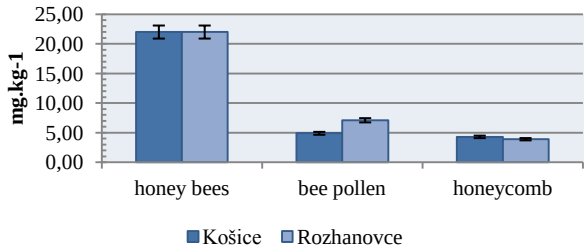

Figure 3: The evaluation of Cu content in honey bees, bee pollen and honeycomb

Very strong statistical significance of the correlations is between copper content in bee pollen and locality, and only between content of copper in honeycomb and in honey bees is weak statistical significance of correlations (table 3).

Table 3 Statistical analysis of Cu content in honey bees and their products and their relationship to the locality

	Locality	*Honey bees*	*Bee pollen*	*Honeycomb*
Locality		+0,1463	+0,9479**	-0,4588
Honey bees	+0,1463		+0,2925	+0,8883*
Bee pollen	+0,9479**	+0,2925		-0,1779
Honeycomb	-0,4588	+0,8883*	-0,1779	

* weak statistical significance of the correlations ($p<0.05$)
** very strong statistical significance of the correlations ($p<0.01$)

The content of lead in honey bees from apiary in Košice varied over a value 3.10±0.70 mg.kg^{-1} of dry matter. Lead content in bee pollen was not detected and in honeycomb was 0.10±0.10 mg.kg^{-1} (was about 31 times higher compared to honey bees) of DM. The lead content in honey bees from apiary in Rozhanovce varied over a value 3.10±0.40 mg.kg^{-1} of DM. The content of lead in bee pollen was 1.10±0.20 mg.kg^{-1} of DM (was about 2.82 times smaller compared to honey bees) and in honeycomb was not detected. Results are shown in the figure 4.

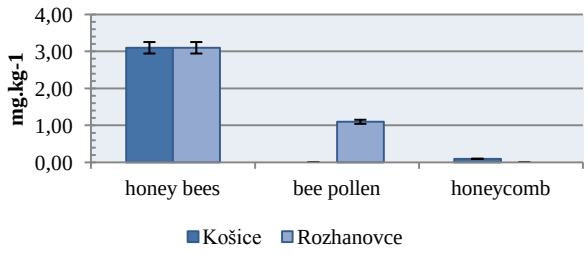

Figure 4: The evaluation of Pb content in honey bees, bee pollen and honeycomb

Very strong statistical significance of the correlations is between lead content in bee pollen and locality and in the case of lead content in samples or locality are no more statistical significance of correlations between evaluated parameters (table 4).

Table 4 Statistical analysis of Pb content in honey bees and their products and their relationship to the locality

	Locality	*Honey bees*	*Bee pollen*	*Honeycomb*
Locality		-0,1257	+0,9787**	-0,6547
Honey bees	- 0,1257		+0,1019	+0,6563
Bee pollen	+0,9787**	+0,1019		-0,6404
Honeycomb	-0,6547	+0,6563	-0,6407	

* weak statistical significance of the correlations ($p<0.05$)
** very strong statistical significance of the correlations ($p<0.01$)

The content of iron in honey bees (146.90±12.40 mg.kg^{-1}) from apiary in Košice was about 1.33 times higher compared to content of iron in honey bees from apiary in Rozhanovce (110.20±8.30 mg.kg^{-1}). The content of zinc in honey bees from apiary in Rozhanovce (152.40±11.70 mg.kg^{-1}) was about 2.70 times higher compared to content of zinc in honey bees from apiary in Košice (56.40±6.70 mg.kg^{-1}). The content of copper in honey bees from apiary in Košice (22.00±3.20 mg.kg^{-1}) was comparable to content of copper in honey bees from apiary in Rozhanovce (22.00±1.70 mg.kg^{-1}). The content of lead in honey bees from apiary in Košice (3.10±0.70 mg.kg^{-1}) was likewise comparable to content of lead in honey bees from apiary in Rozhanovce (3.10±0.40 mg.kg^{-1}). Results are shown in the figure 5.

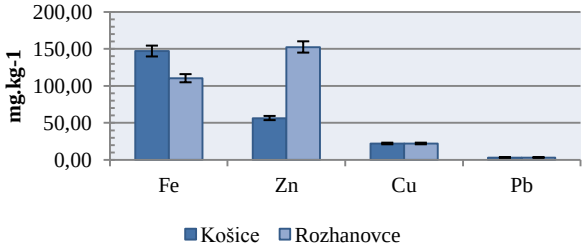

Figure 5: The content of selected heavy metals in honey bees from localities of eastern Slovakia

The content of iron in bee pollen (133.80±9.10 mg.kg^{-1}) from apiary in Košice was about 1.33 times higher compared to content of iron in bee pollen from apiary in Rozhanovce (100.70±7.70 mg.kg^{-1}). The content of zinc in bee pollen from apiary in Rozhanovce (20.40±1.70 mg.kg^{-1}) was about 1.41 times higher compared to content of zinc in bee pollen from apiary in Košice (14.50±2.70 mg.kg^{-1}). The content of copper in bee pollen from apiary in Rozhanovce (7.10±0.50 mg.kg^{-1}) was about 1.45 times higher compared to content of copper in bee pollen from apiary in Košice (4.90±0.40 mg.kg^{-1}). The content of lead in bee pollen from apiary in Košice was not detected and content of lead in bee pollen from apiary in Rozhanovce was higher (1.10±0.20 mg.kg^{-1}). Results are shown in the figure 6.

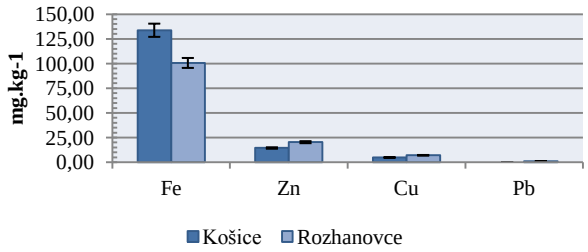

Figure 6: The content of selected heavy metals in bee pollen from localities of eastern Slovakia

The content of iron in honeycomb (182.00±13.70 mg.kg^{-1}) from apiary in Košice was about 3.17 times higher compared to content of iron in honeycomb from apiary in Rozhanovce (57.50±10.70 mg.kg^{-1}). The content of zinc in honeycomb from apiary in Košice (21.80±1.70 mg.kg^{-1}) was about 1.18 times higher compared to content of zinc in honeycomb from apiary in Rozhanovce (18.20±3.30 mg.kg^{-1}).The content of copper in honeycomb from apiary in Košice (4.30±0.60 mg.kg^{-1}) was about 1.10 times higher compared to content of copper in honeycomb from apiary in Rozhanovce (3.90±0.30 mg.kg^{-1}). The content of lead in honeycomb from apiary in Košice was higher (0.10±0.10 mg.kg^{-1}), because lead content in honeycomb from apiary in Rozhanovce was not detected. Results are shown in the figure 7.

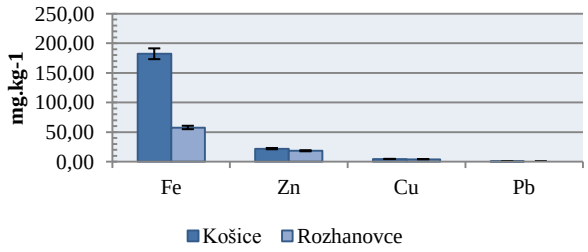

Figure 7: The content of selected heavy metals in honeycomb from localities of eastern Slovakia

4. Conclusions

Accumulation of iron in analysed samples from locality Košice based on obtained results was in the order bee pollen < honey bees < honeycomb, contamination with zinc was increased in the order bee pollen < honeycomb < honey bees. The content of copper was increased in the order honeycomb < bee pollen < honey bees and lead content in samples was increased in the order bee pollen < honeycomb < honeybees. Accumulation of iron in analysed samples from locality Rozhanovce based on obtained results was in the order honeycomb < bee pollen < honey bees, contamination with zinc was increased in the order honeycomb < bee pollen < honey bees. The content of copper was increased in the order honeycomb < bee pollen < honey bees, that is same as in the case of locality Košice and lead content in samples was increased in the order honeycomb < bee pollen < honeybees. To evaluate of the obtained result it can be concluded that analysed samples are mostly contaminated with iron. The contaminated bee pollen and honeycomb poses not only a risk of iron entry into the food chain but also cause a danger for human health. Statistically significant relationship was confirmed between the locality and content of zinc, copper and lead in bee pollen.

Acknowledgements

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Session: Medical Sciences

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ANALYSIS OF THE ARCH OF FOOT IN WOMEN AGED 19 AND 23 YEARS AND RISK FACTORS CAUSING FOOT DEFORMITY

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Abstract: *The arch of the foot absorbs shocks and is an important factor for flexibility of walk. It is easily vulnerable and its failure belongs to the most common orthopaedic diseases. The aim of this study was to determine a percentage of flatfoot in women aged 19 and 23 years, in their mothers and fathers aged 40 and 60 years and to reveal risk factors for this deformity (age, obesity and genetic predisposition). The Chippaux-Šmiřák index was calculated to determine a flatfoot and the body mass index and waist to hip ratio were calculated to determine obesity. The percentage of flatfoot was 4.84 % on the left and 6.45 % on the right in women aged 19 and 23 years. The occurrence of flatfoot in women aged 40-60 years (mothers of young women) was higher. The positive correlation between age and the prevalence of flatfoot was confirmed only on the left foot. The high arch of foot occurred only in older men (fathers of young women). The risk of developing flatfoot has increased with increasing body weight. A similar percentage of occurrences of left and right flatfoot in women whose parents also had a flatfoot can reveal genetic predisposition of the deformity.*

Keywords: *flatfoot, age, obesity, genetic predisposition*

1. Introduction

The arch of the foot acts as *shock absorber*. It absorbs shocks and is an important factor for flexibility of walk [1]. Its main task is to protect the soft structures of the foot and partial absorption of the force resulting from the load weighing [2]. We distinguish normal, low and high arch. They can by observed in the footprint. The print of a normal arch of the foot is medium width; a low arch of the foot is wider. The foot with a high arch creates a narrow print [3]. The arch of the foot is easily vulnerable and its failure belongs to the most common orthopaedic diseases. The often causes of these errors are hypokinesia or obesity [1]. In adult acquired flatfoot is a progressive disease of soft tissue structures, leading to a change of curvature of the foot bones [4]. Volpone [5] believes that flatfoot is common in children of early age and later disappears spontaneously without any treatment. Some authors subsequently confirmed statistically significant relationship between the occurrence of deformities and age of a person, or a genetic predisposition to the deformity [6, 7]. The aim of this study was to determine a percentage of flatfoot in women aged 19 and 23 years, in their mothers and fathers aged 40 and 60 years and to reveal risk factors for this deformity (age, obesity and genetic predisposition).

2. Material and methods

The object of this study were 186 women in aged 19 and 23 years (the mean age 20,80), which are the students of Faculty of Education in Bratislava. We evaluated the highest and lowest width of foot from the footprint (left/right) and calculated the Chippaux-Šmiřák index to determine a flatfoot [8]. The flatfoot was also determined in 165 their mothers in aged 40 an 60 years (the mean age 47,80) and 123 their fathers in aged 40 and 60 years (the mean age 48,98). The Chippaux-Šmiřák index distinguishes three types of normal foot (N1, N2, N3), three types of flatfoot (P1, P2, P3) and three types of foot with high arch (V1, V2, V3). Somatometric standard procedures were examined: body height, body weight, ankle height (left/right), waist and hip circumference. For the determination of obesity, we calculated the body mass index and waist to hip ratio, which we correlated with Chippaux-Šmiřák index (Table 1). There was used statistical program SPSS vs. 17 for statistical data processing.

Table 1 The basic statistics anthropometric parameters

Parameters	*Median*	*Min*	*Max*	*SD*
Body height (cm)	164,00	149,40	179,90	5,30
Body weight (kg)	60,50	44,00	89,00	10,37
Body mass index (kg/m^2)	22,32	17,29	30,94	3,20
Ankle height/left (cm)	7,70	6,00	10,50	0,63
Ankle height/right (cm)	7,85	6,00	10,50	0,69
Waist to hip ratio	0,76	0,59	1,86	0,15
Chippaux-Šmiřák/left	34,50	16,80	72,16	8,31
Chippaux-Šmiřák/right	35,83	15,00	75,79	8,94

3. Results and discussion

The idiopathic flatfoot is a common finding in children and youth. When the weight is carrying on the heel valgus direction, the medial arch flattens [9]. Some authors have hypothesized that in many cases flatfoot in children lead to disability in adulthood [6, 7]. In our study 4.84 % of women aged 19 and 23 years had a left flatfoot and 6.45 % of women had a right flatfoot (Table 2). We reported a bilateral flatfoot in 6 women (3.23 %). The bilateral flatfoot is more rehabilitation issues as unilateral [8]. 30 women reported a diagnostic flatfoot in mean aged 10.44 years. The flatfoot in adults persists in three women aged 19 and 23 years. Chang et al. evaluated the prevalence of flexible flatfoot in Taiwanese school-aged children [10].

They showed a negative correlation between flatfoot and age. The cause is continuing evolution of the structures of the foot or a successful treatment of flatfoot deformity.

Table 2 The percentage of flatfoot in young women

Type of foot		*Left*	*Right*	*Left (%)*	*Right (%)*
Normal foot	N1	36	30	19,35	16,13
	N2	123	114	66,13	61,29
	N3	18	30	9,68	16,13
Flatfoot	P1	6	9	3,23	4,84
	P2	0	0	0,00	0,00
	P3	3	3	1,61	1,61
		186	186	100,00	100,00

Next, we assessed the occurrence of flatfoot by the same method in women aged 40-60 years (mothers of young women). The percentage of flatfoot increased to 14.54 % on the left and 16.37 % on the right (Table 3). The positive correlation between age and the prevalence of flatfoot was confirmed only on the left foot (left foot: $r_s = 0,107$, $p = 0,046$, right foot: $r_s = 0,087$, $p = 0,144$).

Table 3 The percentage of flatfoot in old women (mothers)

Type of foot		*Left*	*Right*	*Left (%)*	*Right (%)*
Normal foot	N1	36	30	21,81	18,18
	N2	81	87	49,09	52,72
	N3	24	21	14,55	12,73
Flatfoot	P1	18	21	10,91	12,73
	P2	6	6	3,64	3,64
	P3	0	0	0,00	0,00
		165	165	100,00	100,00

The percentage of flatfoot in fathers of young women was 19.52 % on both feet. The high arch of foot had 2.44 % of men on the left and 4.88 % of men on the right (Table 4). This type of foot deformity did not exist in women.

Table 4 The percentage of flatfoot in old men (fathers)

Type of foot		*Left*	*Right*	*Left (%)*	*Right (%)*
Normal foot	N1	18	15	14,63	12,19
	N2	69	60	56,09	48,78
	N3	9	21	7,32	17,07
Flatfoot	P1	12	12	9,76	9,76
	P2	6	3	4,88	2,44
	P3	6	6	4,88	4,88
High arch of foot	V1	0	3	0,00	2,44
	V2	3	0	2,44	0,00
	V3	0	3	0,00	2,44
		123	123	100,00	100,00

Shibuya et al. [7] evaluated the incidence of flatfoot in adults (the mean age of men was 43.14 years and women 44.22 years). The gender was not a significant factor for flatfoot deformity. They experienced a statistically significant correlation between age and the presence of flatfoot deformity in women. The risk of developing flatfoot has reduced with increasing age. Therefore we were looking for other risk factors to cause the flatfoot in our study. We investigated whether the greater body weight is a cause of the higher occurrence of flatfoot in young women. For the determination of obesity, we calculated the body mass index and waist to hip ratio, which we correlated with Chippaux-Šmiřák index. We observed a statistically significant positive correlation (Table 5). The risk of developing flatfoot has increased with increasing body weight. Several authors also revealed a higher incidence of flatfoot in obese adolescents or overweight individuals [10, 11 and 12].

Table 5 The correlations between indexes of obesity and index of flatfoot ($\alpha = 0,05$)

Parameters in correlation	*Correlation coefficient*	*p value*
Body mass index/ Chippaux-Šmiřák/left	0,057	0,441
Body mass index/ Chippaux-Šmiřák/right	0,171	*0,019*
Waist to hip ratio/ Chippaux-Šmiřák/left	0,253	*0,001*
Waist to hip ratio/ Chippaux-Šmiřák/right	0,218	*0,003*

The flatfoot in adults is a foot deformity that reduces longitudinal and transverse arch of the foot [13]. We found that the occurrence of flatfoot significantly decreases the arch of the foot. All correlations were negative. That means if the value of the index was higher, the ankle height was lower (Table 6). The flatfoot causes problems that reduce the ability to manage static loads [13].

Table 6 The correlations between ankle height and index of flatfoot ($\alpha = 0,05$)

Parameters in correlation	*Correlation coefficient*	*p value*
Ankle height/left Chippaux-Šmiřák/left	- 0,168	*0,026*
Ankle height/right Chippaux-Šmiřák/right	- 0,251	*0,001*

A higher incidence of flatfoot in older women may be also the result of weight gain. In the absence of information of the body composition in older women, this fact cannot be statistically confirmed. Some authors have confirmed the correlation between higher BMI and flatfoot in older women. Arangio et al. [14] found significantly higher BMI in an adult-acquired flatfoot group compared with a control group without flatfoot. However, the precise meaning of the association was not described, as they did not stratify their analyses on the other variables (in fact, the mean age of the adult-acquired flatfoot group was 51.1 years, whereas that of the control group was 36.7 years). Otsuka et al. [15] found a linear correlation between prevalence of flatfoot and BMI in Japanese women older than 60 years.

Some authors subsequently confirmed statistically significant relationship between the occurrence of deformities and age of a person, or a genetic predisposition to the deformity [6, 7]. We evaluated the incidence of

flatfoot among women whose parents also had flatfoot to detect possible genetic predisposition of flatfoot. If the parents have a left flatfoot, 20.83 % of their daughters also had a left flatfoot. If the parents have a right flatfoot, 26-28 % of their daughters also had a right flatfoot (Table 7). A similar percentage of occurrences of left and right flatfoot in women whose parents also had a flatfoot can reveal genetic predisposition of the deformity.

Table 7 The percentage of flatfoot in women whose parents also had flatfoot

Flatfoot	*Left*	*Right*	*Left (%)*	*Right (%)*
mothers	24	27	100,00	100,00
their daughter	5	7	20,83	25,93
fathers	24	21	100,00	100,00
their daughter	5	6	20,83	28,57

4. Conclusions

In the study the Chippaux-Šmiřák index was used to determine a flatfoot. The percentage of flatfoot was 4.84 % on the left and 6.45 % on the right in women aged 19 and 23 years. The occurrence of flatfoot in women aged 40-60 years (mothers of young women) was higher (14.54 % on the left foot and 16.37 % on the right foot). The positive correlation between age and the prevalence of flatfoot was confirmed only on the left foot. The high arch of foot had 2.44 % of men (fathers of young women) on the left and 4.88 % of men on the right. This type of foot deformity did not exist in women. The risk of developing flatfoot has increased with increasing body weight. The occurrence of flatfoot significantly decreases the arch of the foot. A similar percentage of occurrences of left and right flatfoot in women whose parents also had a flatfoot can reveal genetic predisposition of the deformity.

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APPLICATION OF THE FINITE ELEMENT METHOD IN DETERMINATION OF MODAL AND SPECTRAL PROPERTIES OF PROPELLER SHAFT´S BENDING VIBRATIONS

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Abstract: *The drive with articulated joints is an evolutionary dynamical system. Modal and spectral properties of the relative lateral vibration in a rotating space are dependent on the angular velocity of the shaft rotation. This problem can be the first solved analytically. More complex systems can be solved either by discretization using the finite element method and converting it to eigenvalues, eigenvectors, or using the transfer-matrix method, which is a combination of analytical solutions and numerical methods. The article is derived a finite element for the one-dimensional linear continuum in the state of combined bending-gyratory vibration. Furthermore, the applicaton of the finite element method designed and tuned a method for calculating eigenvalues and vectors of a stepped shaft in the state of combined bending-gyratory vibration. It is made a comparison of the mentioned methods.*

Keywords: *vibration, combined, finite elements, continuum*

1. Introduction

Propeller shafts drives vehicles transmit torque at relatively large distances. Shafts are based on long and slender and must be dimensioned not only in terms of torsional stress (it must eventualy solve torsional vibration of a drive), but it is also necessary to solve the problems of bending vibrations. The authors focused on developing methods for solving modal and spectral properties of Cardan shaft mechanism based on FEM. Propeller shaft does combined gyratory-bending vibrations. The natural frequency of relative lateral vibration depend on the angular velocity of rotation. The authors formulated an element respecting this influence. They compared the results with those obtained by analytical solution and using the transfer-matrix method – for the parameters of the propshaft of the real vehicle.

2. Mathematical model derivation of a finite element of the connecting shaft in a state of combined bending-gyratory vibration.

Consider an element of the shaft in the shape of a prismatic section with the circular cross-section (Figure 1).

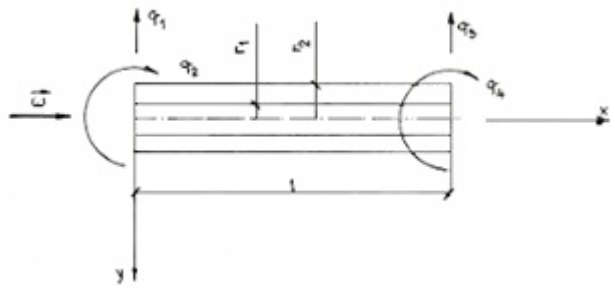

Figure 1: The element of propshaft in a state of combined bending-gyratory vibration

Choose for generalized coordinates, q_i , i = 1,2, ... 4, immediately displacements and rotations at the edges of the cross section. The deflection „yv" of the range $0 \leq x \leq 1$ is expressed as

$$y(x,t) = \sum_{i=1}^{4} q_i(t)\, \emptyset_i(x) \ , \tag{2.1}$$

where

$$\emptyset_i(x) = a_{0i} + a_{1i} + a_{2i}x^2 + a_{3i}x^3 \ . \tag{2.2}$$

Coefficients a_{0i} - a_{3i} choose to apply the following conditions:

$$\begin{aligned} &\emptyset_1(0) = 1 ,\emptyset_2(0) = 0 ,\emptyset_3(0) = 0 ,\emptyset_4(0) = 0 ,\\ &\emptyset_1'(0) = 0 ,\emptyset_2'(0) = 1 ,\emptyset_3'(0) = 0 ,\emptyset_4'(0) = 0 ,\\ &\emptyset_1(l) = 0 ,\emptyset_2(l) = 0 ,\emptyset_3(l) = 1 ,\emptyset_4(l) = 0 ,\\ &\emptyset_1'(l) = 0 ,\emptyset_2'(l) = 0 ,\emptyset_3'(l) = 0 ,\emptyset_4'(l) = 1 . \end{aligned} \tag{2.3}$$

We get the following values:

$$\begin{aligned} &\emptyset_1(x) = 1 - 3\left(\frac{x}{l}\right)^2 + 2\left(\frac{x}{l}\right)^3 ,\\ &\emptyset_2(x) = x - 2\frac{x^2}{l} + \frac{x^3}{l^2} ,\\ &\emptyset_3(x) = 3\left(\frac{x}{l}\right)^2 - 2\left(\frac{x}{l}\right)^3 ,\\ &\emptyset_4(x) = -\frac{x^2}{l} + \left(\frac{x}{l}\right)^3 . \end{aligned} \tag{2.4}$$

Then write the equation (2.1) in matrix form:

$$y(x,t) = \lfloor \emptyset \rfloor \lceil q \rceil \ , \tag{2.5}$$

where

$$\begin{aligned} &\lfloor \emptyset \rfloor = [\emptyset_1 , \emptyset_2 , \emptyset_3 , \emptyset_4] \ ,\\ &\lceil q \rceil = [q_1 , q_2 , q_3 , q_4]^T . \end{aligned} \tag{2.6}$$

The potential energy of an element is equal to the strain energy:

$$E_p = \frac{1}{2} EJ \int_0^l (y^{II})^2 \, dx \ ,$$

respectively, after modification:

$$E_p = \frac{1}{2} EJ \left(\int_0^l \lfloor \emptyset^{II} \rfloor^2 \, dx \right) \lceil q \rceil^2 \ . \tag{2.7}$$

The kinetic energy of the element can be expressed in the following form:

$$E_k = \frac{1}{2} \mu \int_0^l \left(\frac{\partial y}{\partial t} \right)^2 dx + \frac{1}{2} \mu \int_0^l (y\omega)^2 \, dx + \frac{1}{2} \bar{\mu} \int_0^l \left(\frac{\partial^2 y}{\partial x \, \partial t} \right)^2 dx \ ,$$

respectively, after modification:

$$\begin{aligned} E_k &= \frac{1}{2} \mu \left(\int_0^l \lfloor \emptyset \rfloor^2 \, dx \right) \lceil \dot{q} \rceil^2 + \\ &+ \frac{1}{2} \mu \omega^2 \left(\int_0^l \lfloor \emptyset \rfloor^2 \, dx \right) \lceil q \rceil^2 + \\ &+ \frac{1}{2} \bar{\mu} \left(\int_0^l \lfloor \emptyset' \rfloor^2 \, dx \right) \lceil \dot{q} \rceil^2 \ , \end{aligned} \tag{2.8}$$

where

$$\begin{aligned} &\mu = \rho \pi (r_2^2 - r_1^2) \ , \mu = \frac{\pi \rho}{4} (r_2^4 - r_1^4) \ , \\ &J = \frac{\pi}{4} (r_2^4 - r_1^4) \ . \end{aligned} \tag{2.9}$$

Mathematical model of the element is obtained through Lagrange´s Equation, which has the following form:

$$\frac{d}{dt} \left(\frac{\partial E_k}{\partial \dot{q}} \right) - \frac{\partial E_k}{\partial q} + \frac{\partial E_p}{\partial q} = 0 \ . \tag{2.10}$$

Make the appropriate derivations.

We get the following:

$$\begin{aligned} &\frac{\partial E_k}{\partial \lceil \dot{q} \rceil} = \mu \left(\int_0^l \lfloor \emptyset \rfloor^2 \, dx \right) \lceil \dot{q} \rceil + \\ &+ \bar{\mu} \left(\int_0^l \lfloor \emptyset' \rfloor^2 \, dx \right) \lceil \dot{q} \rceil \ , \ \frac{d}{dt} \left(\frac{\partial E_k}{\partial \lceil \dot{q} \rceil} \right) = \\ &= \left(\mu \int_0^l \lfloor \emptyset \rfloor^2 \, dx + \bar{\mu} \int_0^l \lfloor \emptyset' \rfloor^2 \, dx \right) \lceil \ddot{q} \rceil, \\ &\frac{\partial E_k}{\partial \lceil q \rceil} = \mu \omega^2 \left(\int_0^l \lfloor \emptyset \rfloor^2 \, dx \right) \lceil q \rceil, \\ &\frac{\partial E_p}{\partial \lceil q \rceil} = EJ \left(\int_0^l \lfloor \emptyset^{II} \rfloor^2 \, dx \right) \lceil q \rceil \ . \end{aligned} \tag{2.11}$$

These expressions, (2.11), substitute into this equation: (2.10). So, the following applies:

$$\begin{aligned} &\left(\mu \int_0^l \lfloor \emptyset \rfloor^2 \, dx + \bar{\mu} \int_0^l \lfloor \emptyset' \rfloor^2 \, dx \right) \lceil \ddot{q} \rceil + \\ &+ \left(EJ \int_0^l \lfloor \emptyset^{II} \rfloor^2 \, dx - \mu \omega^2 \int_0^l \lfloor \emptyset \rfloor^2 dx \right) \lceil q \rceil = 0 \ . \end{aligned} \tag{2.12}$$

Rewrite the equation (2.12) into the shape:

$$\begin{aligned} &\{ [M_1] + [M_2] \} \lceil \ddot{q} \rceil + \\ &+ \{ [K_1] - [K_2] \} \lceil q \rceil = 0 \ , \end{aligned} \tag{2.13}$$

where

$$[M_1] = \mu \int_0^l \lfloor \emptyset \rfloor^T \lfloor \emptyset \rfloor \, dx = \frac{\mu l}{420} \cdot \cdot \begin{bmatrix} 156 \ , & 22l \ , & 54 \ , & -13l \\ 22l \ , & 4l^2 \ , & 13l \ , & -3l^2 \\ 54 \ , & 13l \ , & 156 \ , & -22l \\ -13l \ , & -3l^2 \ , & -22l \ , & 4l^2 \end{bmatrix} , \tag{2.14}$$

$$[M_2] = \bar{\mu} \int_0^l \lfloor \emptyset' \rfloor^T \lfloor \emptyset' \rfloor \, dx = = \bar{\mu} \begin{bmatrix} \frac{6}{5l} \ , & \frac{1}{10} \ , & -\frac{6}{5l} \ , & \frac{1}{10} \\ \frac{1}{10} \ , & \frac{2}{15l} \ , & -\frac{1}{10} \ , & -\frac{1}{30} \ l \\ -\frac{6}{5l} \ , & -\frac{1}{10} \ , & \frac{6}{5l} \ , & -\frac{1}{10} \\ \frac{1}{10} \ , & \frac{1}{30} \ l \ , & -\frac{1}{10} \ , & \frac{2}{15} \ l \end{bmatrix} , \tag{2.15}$$

$$[K_1] = EJ \int_0^l [\emptyset^{II}]^T [\emptyset^{II}] \, dx = = \frac{EJ}{l^3} \begin{bmatrix} 12 \ , & 6l \ , & -12 \ , & 6l \\ 6l \ , & 4l^2 \ , & -6l \ , & 2l^2 \\ -12 \ , & -6l \ , & 12 \ , & -6l \\ 6l \ , & 2l^2 \ , & -6l \ , & 4l^2 \end{bmatrix} , \tag{2.16}$$

$$[K_2] = \mu \omega^2 \int_0^l \lfloor \emptyset \rfloor^T \lfloor \emptyset \rfloor \, dx = = \mu \omega^2 \begin{bmatrix} 156 \ , & 22l \ , & 54 \ , & -13l \\ 22l \ , & 4l^2 \ , & 13 \, l \ , & -3l^2 \\ 54 \ , & 13l \ , & 156 \ , & -22l \\ -13l \ , & -3l^2 \ , & -22l \ , & 4l^2 \end{bmatrix} \ . \tag{2.17}$$

The equation (2.13) represents the mathematical model of the shaft element according to Figure 1 in a state of bending-gyratory vibration.

3. Mathematical model for bending-gyratory vibrations of the graduated shaft

Consider a dynamic model of the graduated shaft portions determinated by "n" sections of the annular cross-section of the "n" parts (outer radii R_i, inner radii r_i , lengths l_i), mounted on bearings transversely deformable rigidity, ($k_1$left and k_2 right) and rotating angular velocity ω – see Figure 2.

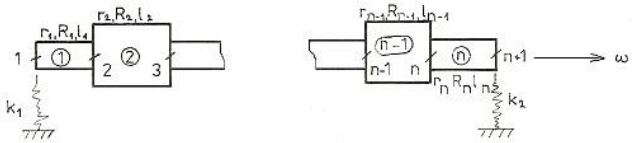

Figure 2

If for generalized coordinate $q_{2\,i-1}$ is chosen lateral displacement of the i-th node and for generalized coordinate

$q_{2\,i}$ (i = 1 , ... , n+1) is chosen angle of the i-th section, applies obviously for the kinetic and potential energy of the system following:

$$E_k = \frac{1}{2}\sum_{i=1}^{n} \dot{\mathbf{q}}_i^T \mathbf{M}_i \dot{\mathbf{q}}_i \ ,$$
$$E_p = \frac{1}{2}\sum_{i=1}^{n} \mathbf{q}_i^T \mathbf{K}_i \mathbf{q}_i + \frac{1}{2}k_1 q_1^2 + \frac{1}{2}k_2 q_{2\,n+1}^2 \ . \quad (3.1)$$

In this expression, M_i a K_i are mass matrix and stifness matrix of the i-th element, see (2.13), (2.14), (2.15), (2.16) and (2.17), where instead of r, R, l use r_i , R_i , l_i. Subvectors the q_i from the vector q of generalized coordinates have the following form:

$$\mathbf{q}_i = \left[q_{(2i-)1}\ ,\ q_{2i}\ ,\ q_{(2i+1)}\ ,\ q_{2(i+1)}\right]^T \ .$$

As further applies

$$E_k = \frac{1}{2}\dot{\mathbf{q}}^T \mathbf{M}\,\dot{\mathbf{q}}\ ,\ E_p = \frac{1}{2}\mathbf{q}^T \mathbf{K}_q \ , \quad (3.2)$$

where **M** and **K** are mass matrix and stiffness matrix of the entire system, we get through comparing (3.1) and **Chyba! Nenalezen zdroj odkazů.**, that the total mass and stiffness matrix has a block tridiagonal form:

$$\mathbf{M} = \begin{bmatrix} \mathbf{M_{11}}\ ,\ \mathbf{M_{12}}\ ,0\ ,\dots,0\ ,0\ ,0 \\ \mathbf{M_{12}^T}\ ,\ \mathbf{M_{22}}\ ,\ \mathbf{M_{23}}\ ,\dots,0\ ,0\ ,0 \\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots \\ 0\ ,0,0,\dots,\ \mathbf{M_{n-1,n}^T}\ ,\ \mathbf{M_{nn}}\ ,\ \mathbf{M_{nn+1}} \\ 0\ ,0\ ,0\ ,\dots,0\ ,\mathbf{M_{nn+1}^T}\ ,\mathbf{M_{n+1,n+1}} \end{bmatrix}, \quad (3.3a)$$

$$\mathbf{K} = \begin{bmatrix} \mathbf{K_{11}}\ ,\ \mathbf{K_{12}}\ ,0\ ,\dots,0\ ,0\ ,0 \\ \mathbf{K_{12}^T}\ ,\ \mathbf{K_{22}}\ ,\ \mathbf{K_{23}}\ ,\dots,0\ ,0\ ,0 \\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots\ \dots \\ 0\ ,0,0,\dots,\ \mathbf{K_{n-1,n}^T}\ ,\mathbf{K_{nn}}\ ,\ \mathbf{K_{nn+1}} \\ 0\ ,0\ ,0\ ,\dots,0\ ,\mathbf{K_{nn+1}^T}\ ,\mathbf{K_{n+1,n+1}} \end{bmatrix}. \quad (3.3b)$$

Individual blocks are square matrixes of 2 and have the following form:

$$\mathbf{K_{11}} = \begin{bmatrix} k_1 + k\ ,\ k_{12}^{(1)} \\ k_{12}^{(1)}\ ,\ k_{22}^{(1)} \end{bmatrix}\ ,$$
$$\mathbf{M_{11}} = \left[mij^{(1)}\right]_{i,j=1}^{2}\ ,$$

$$\mathbf{K_{KK}} = \begin{bmatrix} k_{33}^{(K-1)} + k_{11}^{(K)}\ ,\ k_{34}^{(K-1)} + k_{12}^{(K)} \\ k_{34}^{(K-1)} + k_{12}^{(K)}\ ,\ k_{44}^{(K-1)} + k_{22}^{(K)} \end{bmatrix},$$
$$\mathbf{M_{KK}} = \begin{bmatrix} m_{33}^{(K-1)} + m_{11}^{(K)}\ ,\ m_{34}^{(K-1)} + m_{12}^{(K)} \\ m_{34}^{(K-1)} + m_{12}^{(K)}\ ,\ m_{44}^{(K-1)} + m_{22}^{(K)} \end{bmatrix},$$

for $k = 2\ ,\dots,n\ ,$ (3.4)

$$\mathbf{K_{n+1,n+1}} = \begin{bmatrix} k_{33}^{(n)} + k_2\ ,k_{34}^{(n)} \\ k_{34}^{(n)}\ ,k_{44}^{(n)} \end{bmatrix}\ ,$$
$$\mathbf{M_{n+1,\ n+1}} = \left[mij^{(n)}\right]_{ij=3}^{4}\ ,$$
$$\mathbf{K_{K,\ K+1}} = \begin{bmatrix} k_{13}^{(K)}\ ,\ k_{14}^{(K)} \\ k_{23}^{(K)}\ ,k_{24}^{(K)} \end{bmatrix},$$

$$\mathbf{M_{K,\ K+1}} = \left[mij^{(K)}\right]_{i=1,\ j=3}^{2\ \ 4},$$

for $k = 1\ ,\dots,n_0\ .$

Here is denoted

$$\mathbf{M}_K = \left[m_{i,j}{}^{(K)}\right]_{i,j=1}^{4}\ \ ,\ \ \mathbf{K}_K = \left[K_{i,j}{}^{(K)}\right]_{i,j=1}^{4}$$

for the mass matrix and the stiffness of the individual elements k = 1 , .. , *n* of the expressions (2.13), (2.14), (2.15), (2.16) a (2.17).

Mathematical model of free oscillations has the following form:

$$\mathbf{M\ddot{q} + Kq = 0}\ .$$

Natural frequency system, Ω_i, satisfies the frequency equation:

$$^{\det}\left(-\mathbf{M}\Omega_i^2 + \mathbf{K}\right) = 0\ . \quad (3.5)$$

The eigenvalues v_i (belonging to the i-th natural frequency) satisfy the relation

$$\mathbf{(-M\Omega_i^2 + K)\,v_i = 0}\ . \quad (3.6)$$

Because this relation is ambiguous, we normalize these vectors using the so-called M-norm, ie the relation

$$\mathbf{v_i^T M v_j} = \delta_{ij}\ , \quad (3.7)$$

where δ_{ij} is the Kronecker symbol. Natural frequencies and eigenvectors choos at the base coordinates „y“ that are related to the original coordinates „q“ through transformational relation

$$\mathbf{y = L^T q}\ , \quad (3.8)$$

where L is lower triangular matrix, for which the following applies:

$$\mathbf{M = L\,L^T}\ .$$

Such a matrix exists due to the regularity and the positive definiteness of the matrix weight. The mathematical model in the coordinates „y“ apparently has the form:

$$\mathbf{\ddot{y} + L^{-1}KL^{-T}y = 0}\ . \quad (3.9)$$

Because a symmetric matrix

$$\mathbf{A = L^{-1}KL^{-T}}$$

is similar to the matrix $\mathbf{M^{-1}K = L^{-T}L^{-1}K}$ (despite the similarity matrix $\mathbf{L^{-T}}$), are the eigenvalues of the original model the same as its own model number (3.9). Generalized eigenvalue problem, (3.5), was thus transferred to the common problem of eigenvalues:

$$^{det}\ (-\mathbf{E}\Omega_i^2 + \mathbf{A}) = 0\ . \qquad (3.10)$$

Among the eigenvectors there is a relation analogous to (3.8). If vectors v_i are eigenvectors of the model (3.9) and v_i are eigenvectors of the basic model, then the following applies:

$$\mathbf{u_i} = \mathbf{L^T v_i} \Rightarrow \mathbf{v_i} = \mathbf{L^{-T} u_i}\ .$$

The eigenvectors $\mathbf{u_i}$ satisfy the equation

$$(\mathbf{A} - \mathbf{E}\Omega_i^2)\ \mathbf{u_i} = 0\ ,$$

analogous to (3.6). If these eigenvectors are normalized with Euclidean norm (that is satisfied by $\mathbf{u_i^T u_j} = \delta_{ij}$), we obtain for the corresponding eigenvectors v_i the normalization (3.7). Indeed applies:

$$\delta_{ij} = \mathbf{u_i^T u_j} = \mathbf{v_i^T L L^T v_j} = \mathbf{v_i^T\ M v_j}\ .$$

The eigenvalue problem (3.10) is solved by standard procedure. Convert the matrixes „A“ by orthogonal similarity transformation into tridiagonal form and eigenvalues of the tridiagonal matrix determinate by use of Ql – algorithm (see [3] , [4]). The natural frequency depends on the angular velocity of shaft rotation, with increasing speed decreasing. In the case of $k_1 = k_2 = 0$ is an isolated system with the first zero natural frequency. It makes sense to evaluate the critical angular velocity, when the first (non-zero) natural frequency due to the angular velocity becomes zero, and the system becomes unstable.

4. Numerical verification method

Input parameters of the processed computational model for the regime shaft portions of the annular cross-section of the „n“ sections are the following:

1. n – number of elements
2. r_{1i} - [the program $er_1(i)$] – inner radius vector of elements in order from left to right
3. r_{2i} - [the program $er_2(i)$] – outer radius vector of elements in order from left to right
4. l_i - [v programu eel(i)] – vector lenghts of elements in order from left to right
5. – 10. – the same inputs as the previous regime

The following input parameters were specified for shaft having a constant cross-section:

$r_1 = 0$, $r_2 = 0{,}0105$ m, $l = 0{,}65$ m .

The natural frequency (for $\omega = 0$), the same as the value obtained by the transfer matrix method has been obtained by specifying $k_1 = k_2 = 10^{10}$ Nm^{-1}. The results were gradually specified by entering n = 1,2,5,10 elements.

As expected rotation speed resonance (the first natural frequency decrease with increasing angular speed of shaft rotation to zero) is expected in the interval $\omega \epsilon \langle 600, 700 \rangle$, was taken to $\omega_{min} = 0$, $\omega_{max} = 700$ rad s^{-1} , $\Delta\omega = 100$ rad s^{-1} with potential further specifying the place of speed resonance. The results are shown graphically in the figure number 4. It shows that a significant shift of the natural frequency (the lowest rate) occurs a transition from n = 1 to n = 2. Further increases in the number of elements doesn´t bring substantial changes. Graph Ω_1 (ω) for each of the elements with considerable precision approaching a circle centered at the origin of (ω , Ω) with a radius Ω_1 (0) .

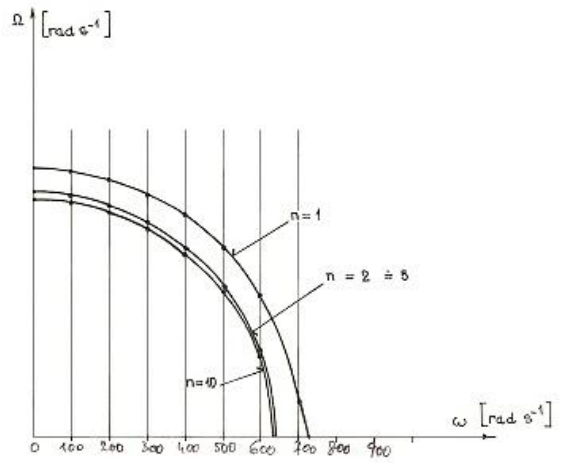

Figure 3

5. Conclusions

Propeller shaft represents a dynamic evolute system.

Frequency of relative transverse oscillations are dependent on the angular velocity of the frame (transportation) rotation. Vibration analysis driveshafts in areas of the spectrum, where the transfer matrix method is unstable, it is a advisable to carry out on the models formulated by FEM.

The authors formulated an element that the influence of the frame (transportation) rotation respect. The element is formulated in a rotating plane. Created software allows automatic compilation of the global mass and stiffness matrices of the connecting shaft Cardan mechanism, solving its spectral and modal properties and evaluate the speed resonance.

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PHYSICAL AND MATHEMATICAL MODELS OF SHAFTS IN DRIVES WITH HOOK´S JOINTS

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Abstract: *The torque of drive vehicles is transmitted at relatively large distances. When dimensioning to the torsion under static and cyclic load, shafts are in many cases long, slender, and are susceptible to bending vibrations. The shafts must be checked not only to torsion, but also to bending in terms of shaft´s modal and spectral properties. The paper formulated a mathematical model of an one-dimensional linear continuum in a state of bending-gyratory vibration. It is performed an analytical solution of natural frequencies relative lateral vibration and it is analyzed the influence of a rotating shaft to spectrum of natural frequencies section of the continuum, that form the basis of shaft´s physical model when calculating its natural and forced vibration.*

Keywords**:** *physical, mathematical, model, shaft, vibration*

1. Introduction

Propeller shafts of drive vehicles transmit a torque at relatively large distances. The shafts are based on long and slender, and must be dimensioned not only in terms of torsional stress, but it is also necessary to monitor its resistance to lateral vibration. Due to the continuous operational area, the shafts are needed to operate in subcritical speed. Results of previous works which were also confronted with experiments showed that the propeller shafts represent strong evolutionary systems (increasing the angular velocity of rotation significantly reduce the spectrum of natural frequency relative lateral vibrations) and in practical calculations it is necessary to respect this influence. For that reason, it is not possible to model the shafts using procedures that are commonly reported in the literatura, but it is necessary to formulate a model that allows this effect respected.

2. Formulation of a problem, used processing methods

Propeller shafts are in a steady state stressed by excitation bending moments harmonic, and their vectors are orthogonal to the rotating plane of a relevant fork Hook´s joints (Figure 1). The drive torque mentioned generate in a steady state due to the transmission flow through Hook´s joints and cause lateral oscillations of the propeller shafts in its rotating space. In formulating a mathematical model, it is necessary to start from the assumption of formation relative spatial bending vibration in the shaft system 0(x, y, z) (Figure 2), which rotates at an angular speed $\vec{\varphi}_x$. If we neglect the Coriolis force and gyroscopic moments acting on the element of the shaft, we can solve the problem in the rotating plane 0(x, y). The instantaneous state of the element is determined by the angular velocity $\vec{\varphi}_x$, the velocity $\vec{v}$ and the angular velocity $\dot{\vec{\varphi}}_{z_s}$. This article aims to build a mathematical model of a coupling shaft to calculate spectral and modal properties of the connecting shaft with respect to the field of centrifugal forces that is causing the addiction of natural frequencies of bending vibrations relative to the angular velocity of the shaft´s rotation.

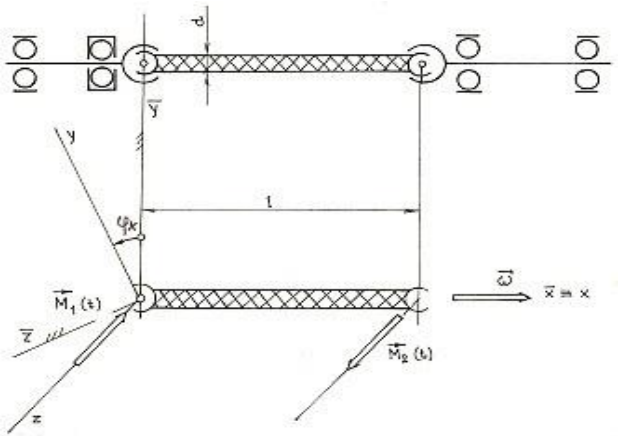

Figure 1

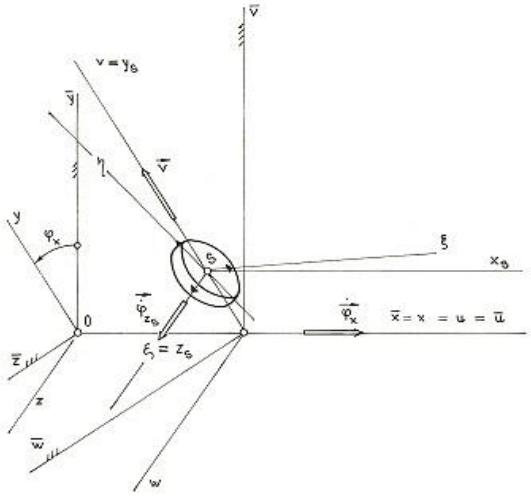

Figure 2

The problem is solved step by step. In the third chapter, there is constructed by the method of physical discretization a simple model (of the solved problem), which is evident from the nature of the centrifugal force field´s influence on the spectral properties of the shaft. In the chapter 4, there is performed an analytical solution of speed resonances propshaft´s test model, whose aim is to obtain values for verification subsequently processed models based on the transfer-matrix method and the finite element method.

3. Solving the problem by physical discretization

Let´s replace the driveshaft which is shown in the Figure 1 (consider solid bearings) by discrete mechanical system with one degree of freedom. Divide it into two equal halves which will represent an intangible spring (Figure 3) having rigidity $\frac{k}{2}$.

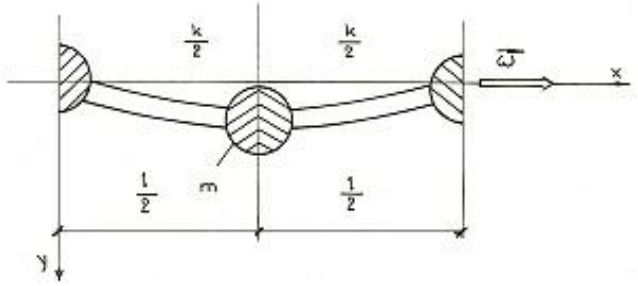

Figure 3

Concentrate the weight to endpoints of the springs so that two fixed points belong to their supports (for x = 0, resp. x = 1), the other two fixed points merge into one with a weight m = Slρ /2 in the middle of the shaft (x = 1/2). The resulting discrete model of a connecting shaft is shown in the Figure 4. Let´s determine the spring stiffness of the relation:

$$k = \frac{48EJ}{l^3} \ , \tag{3.1}$$

further determine weight discrete compensation (weight of fixed point) from the relationship

$$m = \frac{\rho S l}{2} \ , \tag{3.2}$$

where

$$J = \frac{\pi}{4} r^4, \ S = \pi r^2 \ . \tag{3.3}$$

Description of physical quantities above relationships is the following:

l [m] ... shaft length,
r [m] ... radius shaft,
ρ[kgm^{-3}] ... material density,
E [Pa] ... modulus of elasticity in tension.

Assuming a constant angular velocity $\bar{\omega}$, it is necessary to induce the moment $\vec{M}$. We compile equations of motion using the Lagrange´s equations. For generalized coordinates we choose rotation φ_x and displacement y (in the static equilibrum position, there assumed fixed point on the axis of rotation). The kinetic energy of a fixed point is expressed in the form:

$$E_k = \frac{1}{2} m\dot{y}^2 + \frac{1}{2} m (y\dot{\varphi}_x)^2 \ , \tag{3.4}$$

the potential energy stored in the spring is expressed in the form:

$$V = \frac{1}{2} ky^2 \ . \tag{3.5}$$

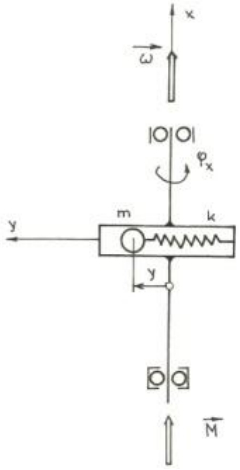

Figure 4

We receive equations of motion in the form:

$$m\ddot{y} + (k - m\omega^2) y = 0 \ , \ M - 2my\dot{y}\omega = 0 \tag{3.6}$$

Then we rewrite the equation of relative oscillating movement in the rotating plane in the form:

$$\ddot{y} + \Omega^2 y = 0 \ , \tag{3.7}$$

where

$$\Omega = \sqrt{\frac{k}{m} - \omega^2} \tag{3.8}$$

it is the natural frequency of relative undamped oscillations.

From the equation ((3.**8**) it is obvious that the frequency of relative oscillations depends on the relative angular velocity of rotation. The system is obvious stable only in cases the following condition is satisfied:

$$\omega^2 < \frac{k}{m} \ . \tag{3.9}$$

We modifie the equation ((3.**8**) into this form:

$$\Omega^2 + \omega^2 = \frac{k}{m} \ , \tag{3.10}$$

which is the equation of a circle with a radius $\sqrt{\frac{k}{m}}$ centered at the origin of the system 0(ω, $\boldsymbol{\Omega}$). Due to the physical nature of the problem, it applies to only a quarter of the circle in the first quadrant. The above procedure will be applied to the propeller shaft of the following parameters (it is the propeller shaft of the vehicle Š 781):

r = 0,0105 [m] , l = 0,65 [m] ,

E = 2,1.10^{11} [Pa] , ρ = 7,8.10^{3}[kg.m^{-3}] .
You will receive the following calculations:

$$J = \frac{\pi}{4} r^4 = \frac{\pi}{4} (0{,}0105)^4 = 9 \cdot 10^{-4} \text{ [m}^4\text{]},$$

$$S = \pi r^2 = \pi\,(0{,}0105)^2 = 3{,}46 \cdot 10^{-4} \text{ [m}^2\text{]} ,$$

$$k = \frac{48EJ}{l^3} = \frac{48 \cdot 2{,}1 \cdot 10^4 \cdot 9 \cdot 10^{-4}}{0{,}65^3} = 3{,}3 \cdot 10^5 \text{[N/m]},$$

$$m = \frac{\rho S l}{2} = \frac{7{,}8 \cdot 10^3 \cdot 3{,}46 \cdot 10^{-4} \cdot 0{,}65}{2} = 0{,}88 \text{ [kg]},$$

$$\boldsymbol{\Omega}\,(0) = \left(\frac{k}{m}\right)^{\frac{1}{2}} = \left(\frac{3{,}3 \cdot 10^5}{0{,}88}\right)^{\frac{1}{2}} = 612{,}4 \text{ [rads}^{-1}\text{]}.$$

In this case, the natural frequency dependence of the relative transversal oscillations is shown in the Figure 5.

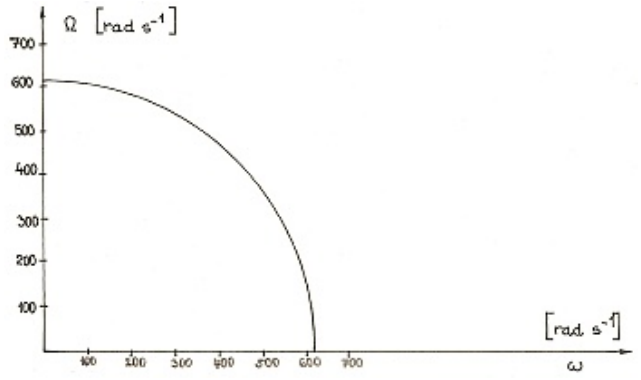

Figure 5: The natural frequency dependence of discrete model´s relative transverse vibration (shown in Figure 4) on the angular velocity of rotation

4. Speed resonance analytical solution of propeller shaft´s test model

In the reference number [1], there was derived an equation of an one-dimensional continuum oscillating in a plane in the following form:

$$\frac{\partial^4 y}{\partial x^4} - \frac{\rho S r^2}{4EJ} \cdot \frac{\partial^4 y}{\partial x^2\,\partial t^2} - \frac{\rho S r^2 \omega^2}{4EJ} \cdot \frac{\partial^2 y}{\partial x^2} + \frac{\rho S}{EJ} \cdot \frac{\partial^2 y}{\partial t^2} - \frac{\rho S \omega^2}{EJ} y = 0 \ , \qquad (4.1)$$

where is:
y = y(x,t) .... instantaneous displacement of centre-section in the rotating plane
ρ [kgm^{-3}] .... material density
S [m^{-2}] .... cross sectional area
J [m^4] .... geometrical moment of inertia about an axis perpendicular to the neutral axis
E [Pa] .... modulus of elasticity in tension or compression
r [m] .... radius of the circular cross section of the shaft
ω [$rads^{-1}$] .... the angular velocity of rotation of the plane 0(x,y) around the axis x

The above equation of motion will be applied when calculating the natural frequencies of propeller shaft´s test model. This is a shaft of constant circular cross section in rigid bearings which does the bending vibration during rotation (see Figure 6).

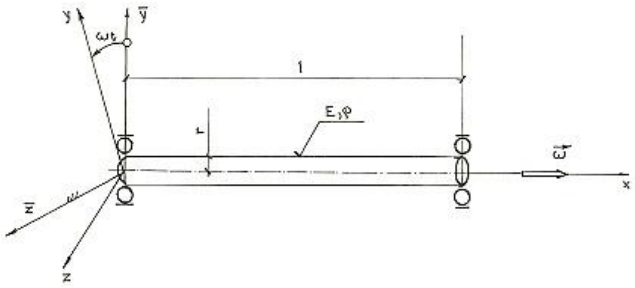

Figure 6: Test model for calculation of propeller shaft´s speed resonance

Assume that each shaft section is held oscillating movement with an amplitude dependent on the place are of the time course the same for the whole shaft. Then we can look for solution in the following form:

$$y(x,t) = Y(x)\, e^{i\Omega t} \ , \qquad (4.2)$$

where it is:

Y(x) … an amplitude of deflection on the x-coordinate
$\boldsymbol{\Omega}$ [rad s^{-1}] … the desired angular frequency oscillations of its own

The solution (4.2) is substituted for (4.1):

$$\left[Y^{IV}(x) + \frac{\rho S r^2 \Omega^2}{4EJ} Y^{II}(x) - \frac{\rho S r^2 \omega^2}{4EJ} Y^{II}(x) - \right. \qquad (4.3)$$
$$- \rho S \Omega 2EJ\, Yx - \rho S \omega 2EJ\, Y(x) e i\Omega t = 0$$

If the equation (4.3) has to be satisfied identically at each time, must apply:

$$Y^{IV}(x) + bY^{II}(x) - cY(x) = 0 \ ,$$

where

$$b = \frac{\rho S r^2}{4EJ}(\Omega^2 - \omega^2) \quad , \qquad (4.4)$$
$$c = \frac{\rho S}{EJ}(\Omega^2 + \omega^2) \quad .$$

Due to boundary conditions (the shaft is mounted on rigid bearings), we look for solution of the amplitude equation in the form:

$$Y(x) = Y \sin k_n x \quad , \qquad (4.5)$$

where

$$k_n = \frac{\pi n}{l} , \; n = 1,2, \ldots , \qquad (4.6)$$

l is the lenght of the shaft. Then we substitute the envisaged solution (4.5) into the amplitude´s equation (4.4):

$$[k_n^4 - b k_n^2 - c] \; Y \sin k_n x = 0 \quad . \qquad (4.7)$$

From the condition of nontrivial solution of the equation (4.7) we obtain a frequency equation of the form:

$$k_n^4 - b k_n^2 - c = 0 \quad . \qquad (4.8)$$

From the equation (4.8) we obtain the relation for angular frequencies of shaft´s relative transverse oscillations in the form:

$$\Omega_n = \left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} \left\{ \frac{\left(\frac{\pi n}{l}\right)^4 - \frac{\rho S \omega^2}{EJ}\left[1 - \left(\frac{\pi n r}{2l}\right)^2\right]}{1 + \left(\frac{\pi n r}{2l}\right)^2} \right\}^{\frac{1}{2}} . \qquad (4.9)$$

For the first angular frequency, when focusing on long, slender shafts (l >> r), the term (4.9) is in simplified form:

$$\Omega = \left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} \left[\left(\frac{\pi}{l}\right)^4 - \frac{\rho S \omega^2}{EJ}\right]^{\frac{1}{2}} . \qquad (4.10)$$

In case ω = 0

$$\Omega = \frac{r}{2}\left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} \cdot \left(\frac{\pi}{l}\right)^2 ,$$

or, if we substitute for J, S

$$\Omega = \frac{r}{2}\left(\frac{E}{\rho}\right)^{\frac{1}{2}} \cdot \left(\frac{\pi}{l}\right)^2 . \qquad (4.11)$$

a known relationship to its angular frequency of beam´s transverse oscillations of constant circular cross-section on solid supports. Before we proceed to the quantification of the above relationships, analyze the impact of the angular velocity of rotation on its angular frequency of transverse oscillations of the shaft. We modify the expression (4.10) in the form:

$$\Omega^2 = a^2(b - c\omega^2) \quad , \qquad (4.12)$$

where

$$a = \left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} \quad , \quad b = \left(\frac{\pi}{l}\right)^4 \quad , \quad c = \frac{\rho S}{EJ} = \frac{1}{a^2} \quad . \qquad (4.13)$$

We modify the expression (4.12) to the form:

$$\frac{\Omega^2}{ba^2} + \frac{\omega^2}{\frac{b}{c}} = 1 \; , \qquad (4.14)$$

where

$$ba^2 = \left(\frac{\pi}{l}\right)^4 \cdot \frac{EJ}{\rho S} = R^2, \frac{b}{c} = \left(\frac{\pi}{l}\right)^4 \cdot \frac{EJ}{\rho S} = R^2 .$$

Thus, the equation (4.14) can therefore be rewritten into the
form:

$$\frac{\Omega^2}{R^2} + \frac{\omega^2}{R^2} = 1 \quad , \qquad (4.15)$$

which is in the coordinate system of the 0(ω, **Ω**) a equation of a circle of radius:

$$R = \left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} \left(\frac{\pi}{l}\right)^2 = \frac{r}{2}\left(\frac{E}{\rho}\right)^{\frac{1}{2}} \left(\frac{\pi}{l}\right)^2 \quad . \qquad (4.16)$$

The radius is equal to its angular frequency of shaft´s transverse oscillations at zero speed. The calculation is performed for

$E = 2{,}1.10^{11}$ [Pa], $\rho = 7{,}8.10^3$ [kg.m^{-3}] , r = 0,0105 [m] ,l = 0,65 [m] .

$$R = \frac{0.0105}{2}\left(\frac{2{,}1 \cdot 10^{11}}{7{,}8 \cdot 10^3}\right)^{\frac{1}{2}} \cdot \left(\frac{\pi}{0{,}65}\right)^2 = 636{,}35 \text{ [rad s}^{-1}\text{]} \; .$$

The functional dependence graph $\boldsymbol{\Omega} = \boldsymbol{\Omega}(\omega)$ for the considered test example is shown in Figure 7.

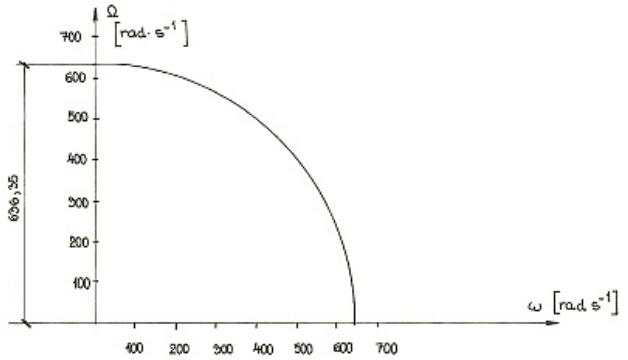

*Figure 7: The graph functional dependence of the angular frequency (**Ω**) lateral vibrations relative to the angular speed of rotation of the proppeller shaft´s test model.*

5. Conclusions

As a result of the torque transmission through Hook´s joints, the connecting shaft is loaded by additional dynamic bending moments in the plane of the rotating propeller shaft. We can not accept the assumption that shaft deflection wheels, as in the case of a simple circular

vibration of the continuum, but as a result of excitation rotating torque is obviously forced to hold the relative transversal oscillations. In the first step we formulate a mathematical model of transverse oscillations in the rotating plane. It is performed an analytical solution. On the test model, there is performed numerical solution that is used in the next step for tuning accurate models based on the transfer-matrix method and on the finite element method.

References

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THE TRANSFER-MATRIX METHOD IN THE APPLICATION FOR AN ONE-DIMENSIONAL LINEAR CONTINUUM SPEED RESONANCE

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Abstract: *The basic element for creating computational models of shafts is an one-dimensional linear continuum. Consider the one-dimensional continuum in a state of combined bending-gyratory vibration. Modal and spectral properties of relative lateral vibration in the rotating area are dependent on the angular velocity of shaft rotation. The problem can be after a first approximation solved analytically. More complex systems can be solved either using the finite element discretization method and converting to the problem of eigenvalues, eigenvectors, or using the transfer-matrix method, which is combination of analytical solution and numerical methods. The paper described the use of the transfer-matrix method for solving of one-dimensional linear continuum speed resonance in a state of bending-gyratory vibration. The authors drew a comparison between the results achieved by the transfer-matrix method and the results of the analytical solution.*

Keywords: *vibration, combined, bending, gyratory*

1. Introduction

Propeller shafts of drive vehicles transmit a torque at relatively large distances. The shafts are long and slender, and must be dimensioned not only in terms of torsional stress, but it is also necessary to monitor their resistance to the lateral vibration. Due to the continuous operational area, the shafts must be operated in the region below the critical speed. A lot of failures in the operating of shafts in drive vehicles were an incentive to the formations of academic works dealing with the analysis of the shaft´s lateral vibration in drives with Hook´s joints. The results of previous academic works which were also confronted with experiments showed that propeller shafts represent strong evolutionary systems (increasing the angular velocity of rotation significantly reduce the spectrum of natural frequencies relative transverse vibrations) and it is necessary to respect this influence in practical calculations. In specific cases of structural variants, the critical values decline was 50 %. The paper described the basic approach using the transfer-matrix method for calculating the natural frequencies of the relativ lateral vibration and resonance speed evalution. The authors drew a comparison between the results of analytical solution and the results obtained using the transfer-matrix method.

2. Formulation of the problem, objective solutions

Propeller shafts are in a steady state stressed by bending moments harmonic, and their vectors are orthogonal to the rotating plane of Hook´s joints relevant fork. The mentioned exciting moments generate in a steady state due to the transmission power flow through Hook´s joints and cause lateral oscillations of propeller shaft in the rotating plane. The basic element of propeller shaft´s physical models is an one-dimensional continuum section. The authors of the paper focused on application of the transfer-matrix method in determination of speed resonance of that element.

3. Physical model of continuum test section

This is a shaft of constant circular cross section in rigid bearings which makes the bending vibration during rotation, i. e. the relative transverse vibrations in the rotating plane or combined bending-gyratory vibration (see Figure 1).

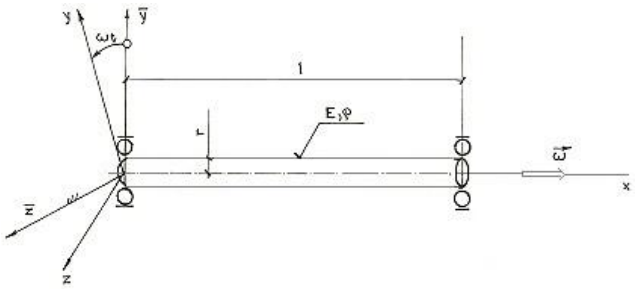

Figure 1: The test model for calculation of propeller shaft´s speed resonance.

The physical model is constituted by an one-dimensional continuum of constant circular cross section.

It is defined by

- geometrical parameters:

l [m] …the length of the one-dimensional continuum,
r [m] … the radius of the circular cross section of the shaft,

- material constants:

ρ [kgm^{-3}]… the material density,
E [Pa] … the modulus of elasticity in tension or compression,

- operating parameter:

ω [$rads^{-1}$] …the angular velocity of rotation of the plane 0(x,y) around the axis x.

4. Mathematical model of the one-dimensional linear continuum in a state of combined bending-gyratory vibration

Let´s focus first on calculation the relative transverse vibrations´ angular frequency of the propeller shaft´s test model using the transfer-matrix method which is described in detail in the reference number [1]. In [1] it was in detail derived a equation of motion of the one-dimensional continuum oscillating in the rotating plane in the following form:

$$\frac{\partial^4 y}{\partial x^4} - \frac{\rho S r^2}{4EJ} \cdot \frac{\partial^4 y}{\partial x^2 \, \partial t^2} - \frac{\rho S r^2 \omega^2}{4EJ} \cdot \frac{\partial^2 y}{\partial x^2} + \frac{\rho S}{EJ} \cdot \frac{\partial^2 y}{\partial t^2} - \\ - \frac{\rho S \omega^2}{EJ} y = 0 \ , \qquad (4.1)$$

y = y(x,t) …the immediate deflection of center section in the rotating plane,
S [m^2] … the cross sectional area,
J [m^4]… the geometrical moment of inertia (quadratic moment of inertia) to an axis perpendicular to the neutral axis.

5. Application of the transfer-matrix method in calculating natural frequencies of the relative transversal oscillations

The equation (4.1), respectively its solution, is used when calculating the relative transverse vibrations´ natural frequency of the propeller shaft´s test model in a state of steady bending-gyratory vibration, using the transfer-matrix method. Assume that each shaft section makes oscillating movement with an amplitude dependent on the site are of the time course the same for the entire shaft. The solution is found in the following form:

$$y(x,t) = Y(x)\, e^{i\Omega t} \ , \qquad (5.1)$$

where Y(x) is the deflection amplitude at the coordinate x, $\boldsymbol{\Omega}$ [rad s^{-1}] is the desired angular frequency oscillations of its own. The solving the equation, i.e. its deflection, slope deflection lines, bending moment and shear force to coordinate of x) are arranged in that order into a vector state of **V**(x) which is bound with the initial vector state to a coordinate of x=0 by the following custodial relationship:

$$\mathbf{V}(x) = \mathbf{H}(x)\mathbf{V}(0) \ . \qquad (5.2)$$

The boundary vectors of the shaft condition

V(0) , **V**(1)

are bound by transfer matrix of continuum section

H(l) .

The following applies:

$$\mathbf{V}(l) = \mathbf{H}(l)\mathbf{V}(0) \ , \qquad (5.3)$$

where

$$\mathbf{V}(l) = \begin{bmatrix} 0 \\ Y'(l) \\ 0 \\ -Q(l) \end{bmatrix} \ , \quad \mathbf{V}(0) = \begin{bmatrix} 0 \\ Y'(0) \\ 0 \\ -Q(0) \end{bmatrix} \qquad (5.4)$$

these are marginal state vectors for the intended type of deposit, i.e. zero deflection, zero bending moments at the edges.

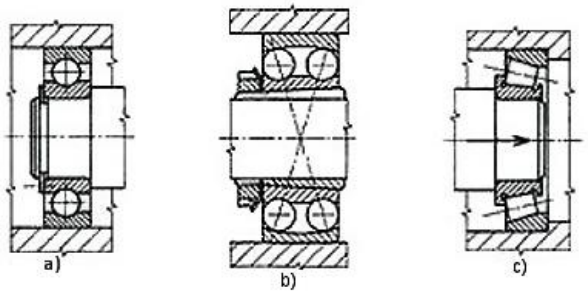

Figure 2

Single row deep groov ball bearings or double row self-aligning best meet these boundary conditions in structural design (structural, functional model). Their pliability neglect, they are considered perfectly rigid (see Figure 2.a,b). In the case of tapered roller bearings, as shown in Figure 2 c, we consider zero deflection and the slope of the line deflection, then zero bending moment and shear force.

In the coupling equation (4), there represents the matrix

$$\mathbf{H} = [H_{rs}]_1^4 \qquad (5.5)$$

not only the transfer matrix of continuum section, but in this simple case, also transfer matrix system.

Y′ (0), Y′ (l) are the amplitudes of the deflection slope line, Q(0), Q(1) are the amplitudes of shear forces at the edges of the shaft. Transfer matrix elements mentioned in the paper below.

From relationships (5.1), (5.2), (5.3) we obtain a system of linear homogeneous equations for the unknown amplitudes of state variables in the following form:

$$\begin{bmatrix} H_{12}, -H_{14}, & 0, & 0 \\ H_{22}, -H_{24}, & -1, & 0 \\ H_{32}, -H_{34}, & 0, & 0 \\ H_{42}, -H_{44}, & 0, & 1 \end{bmatrix} \cdot \begin{bmatrix} Y'(0) \\ Q(0) \\ Y'(l) \\ Q(1) \end{bmatrix} = \mathbf{0} \ . \qquad (5.6)$$

From the condition of nontrivial solution of (5.4) we obtain the frequency equation in the following form:

$$H_{12}H_{34} - H_{14}H_{32} = 0 \ . \qquad (5.7)$$

According to the reference number [1] is

$$H_{12}=\frac{1}{\beta}\left(\frac{\beta_2^2}{\beta_1}Z_2+\frac{\beta_1^2}{\beta_2}Z_4\right),$$
$$H_{34}=\frac{1}{\beta}(\beta_1 Z_2+\beta_2 Z_4),$$
$$H_{14}=\frac{1}{\beta EJ}\left(\frac{Z_2}{\beta_1}-\frac{Z_4}{\beta_2}\right), \quad (5.8)$$
$$H_{32}=\frac{EJ}{\beta}(\beta_1\beta_2^2 Z_2-\beta_1^2\beta_2 Z_4),$$

where

$$\beta_1=\left[-\frac{b}{2}+\left(\frac{b^2}{4}+c\right)^{\frac{1}{2}}\right]^{\frac{1}{2}},$$
$$\beta_2=\left[\frac{b}{2}+\left(\frac{b^2}{4}+c\right)^{\frac{1}{2}}\right]^{\frac{1}{2}}, \quad (5.9)$$
$$\beta=\beta_1^2+\beta_2^2,$$

$$b=\frac{\rho S r^2}{4EJ}(\Omega^2-\omega^2), \quad c=\frac{\rho S}{EJ}(\Omega^2+\omega^2),$$

$Z_1=\mathrm{ch}\beta_1 l$, $Z_2=\mathrm{sh}\,\beta_1 l$, $Z_3=\cos\beta_2 l$,
$Z_4=\sin\beta_2 l$.

The expressions of (5.6) are substituted into the frequency equation (5.5):

$$\frac{1}{\beta^2}\left(\beta_2^2 Z_2^2+Z_2 Z_4\frac{\beta_2^4+\beta_1^4}{\beta_1\beta_2}+\beta_1^2 Z_4^2\right)=\frac{1}{\beta^2}(\beta_2^2 Z_2^2-$$
$$2\beta 1\beta 2\, Z2Z4+\beta 12Z42 ,$$

whence further follows (for $\beta_1>0$, $\beta_2>0$)

$$Z_2 Z_4\left(\frac{\beta_1^4+\beta_2^4}{\beta_1\beta_2}+2\beta_1\beta_2\right)=0 . \quad (5.10)$$

$$\beta_2 l=\pi, n \text{ , where } n=1,2,... \quad (5.11)$$

Let´s substitute the expressions from (5.7):

$$\left[\frac{b}{2}+\left(\frac{b^2}{4}+c\right)^{\frac{1}{2}}\right]^{\frac{1}{2}}=\frac{\pi n}{l} . \quad (5.12)$$

We receive after modyfying the following equation:

$$c+b\left(\frac{\pi n}{l}\right)^2-\left(\frac{\pi n}{l}\right)^4=0 . \quad (5.13)$$

For expressions c, b substitute the expressions from (5.7):

$$\frac{\rho S}{EJ}(\Omega^2+\omega^2)+\frac{\rho S r^2}{4EJ}\left(\frac{\pi n}{l}\right)^2(\Omega^2-\omega^2)-$$
$$-\left(\frac{\pi n}{l}\right)^4=0 . \quad (5.14)$$

From the relations (5.12) we obtain the wanted circular frequencies (due to the physical nature of the problem we are interested only in real positive roots)

$$\Omega_n=\left\{\frac{\left(\frac{\pi n}{l}\right)^4-\frac{\rho S\omega^2}{EJ}\left[1-\left(\frac{\pi r n}{2l}\right)^2\right]}{1+\left(\frac{\pi r n}{2l}\right)^2}\right\}^{\frac{1}{2}}\cdot\left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}} . \quad (5.15)$$

Comparing the expressions (5.13) with the results of analytical solutionss

$$\Omega_n=\left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}}\left\{\frac{\left(\frac{\pi n}{l}\right)^4-\frac{\rho S\omega^2}{EJ}\left[1-\left(\frac{\pi n r}{2l}\right)^2\right]}{1+\left(\frac{\pi n r}{2l}\right)^2}\right\}^{\frac{1}{2}}, \quad (5.16)$$

we conclude that application of the transfer-matrix method gives the same resulst as direct anlytical solution of the problem. It is due to the fact that formulation of the transfer matrix for the shaft is based on an exact analytical solution of continuum´s differential equations throughout the length *l* of constant cross-section. The expression (5.16) can be for the first angular frequency – if we focus on long, slender shafts (l >> r) – simplified to the following form:

$$\Omega=\left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}}\left[\left(\frac{\pi}{l}\right)^4-\frac{\rho S\omega^2}{EJ}\right]^{\frac{1}{2}} . \quad (5.17)$$

The mentioned expression we got when neglecting the Coriolis acceleration and gyroscopic effects. The dependence of the frequency spectrum to the angular velocity of rotation brings to system the centrifugal force field when the propeller shaft oscillates laterally by simultaneous rotation.

When ω = 0, the following applies:

The equation (5.8) has a nontrivial solu

$$\Omega=\left(\frac{EJ}{\rho S}\right)^{\frac{1}{2}}\cdot\left(\frac{\pi}{l}\right)^2,$$

or if we substitute for J, S:

$$\Omega=\frac{r}{2}\left(\frac{E}{\rho}\right)^{\frac{1}{2}}\cdot\left(\frac{\pi}{l}\right)^2, \quad (5.18)$$

which is the known relationship for the natural angular frequency of plane transverse oscillations of constant circular cross-section´s one dimensional prism bonded to the frame by two general kinematic pairs.

The calculation performed for:

$E=2{,}1.10^{11}$ [Pa] , $\rho=7{,}8.10^3$ [kg.m^{-3}] ,
r = 0,0105 [m] , l = 0,65 [m] .

$$R=\frac{0.0105}{2}\left(\frac{2{,}1\cdot10^{11}}{7{,}8\cdot10^3}\right)^{\frac{1}{2}}\cdot\left(\frac{\pi}{0{,}65}\right)^2=636{,}35\ [\mathrm{rad\ s^{-1}}] .$$

The functional dependence graph of the first natural angular frequency $\boldsymbol{\Omega}$ of the relative lateral vibration to the angular rotation speed of the propeller shaft´s test model

$$\boldsymbol{\Omega} = \boldsymbol{\Omega}\,(\omega) \qquad (5.19)$$

is shown in Figure 3. Given that these are the geometrical parameters and material constants of the real vehicle propulsion, it is evident that the drives of vehicles normally operate in the areas of speed when it is necessary (when considering the resistance of the connecting shaft to the transverse oscillation) the effect of the fall of the frequency relative transverse oscillations spectrum (depending on the rotation angular velocity) take into account.

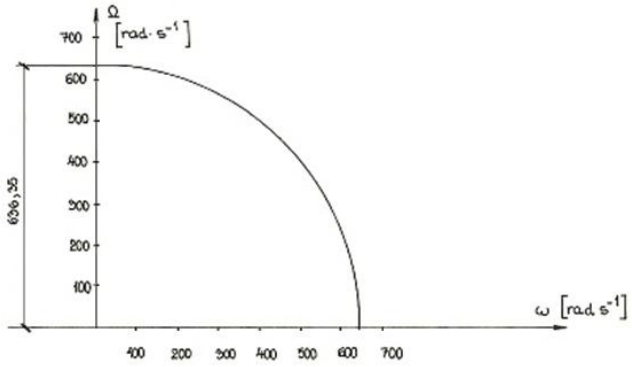

Figure 3: The functional dependence graph of the first natural angular frequency $\boldsymbol{\Omega}$ of the relative lateral vibration to the angular rotation speed ω of the propeller shaft´s test model

6. Speed continuum resonance in a state of combined bending-gyratory vibration

Let´s deal with evaluating of critical speed of the one-dimensional continuum´s section of constant circular cross-section. Using the transfer-matrix method, we solved the natural frequency of relative transverse oscillation which results from excitation by rotating dynamic bending moments and takes place in a plane rotating at a constant angular velocity. For the continuum is critical status when the relevant circular frequency of relative transversal oscillations is equal just the angular velocity of the rotation.

As seen from Figure 4, this state occurs when simultaneously fulfilled Ω=ω and functional dependence (5.19).

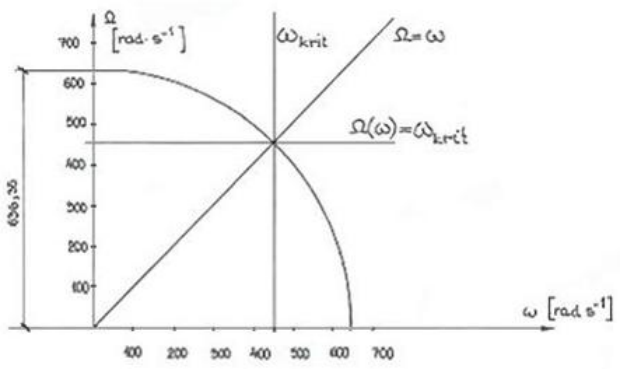

Figure 4: Evaluation of the speed resonance of the propeller shaft´s test model

7. Conclusions

The transfer-matrix method is one of the most used methods when solving problems of the dynamics of an one-dimensional continuum. It is particularly suited for cases where applies for the geometric parameters of the continuum element (segment) the r<< l. The method is relatively simple and not increase the order of the transfer matrix. The method is also suitable for „manual" calculations on a desktop or a laptop. Regarding the planar oscillation which the authors of the paper dealing with, this is the fourth order matrix. The method is combination of an exact analytical solution and numerical solution of the frequency determinant. According to the literature, the method is generally in some areas of calculations numerically unstable. The authors of such a problem in solving concrete problems of real drive cars especially trucks not seen, however, in this case it is applied the finite element method. The paper described the use of the transfer matrix method to the propeller shaft test model in the shape of an one-dimensional continuum stored in rigid bearings. The paper described the methodology of evaluation of speed resonance. The results obtained are compared with the analytical solution.

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THE RISKS AND POSSIBILITIES OF REDUCTION THE IMPACT OF CODEPENDENCE FOR FAMILY MEMBERS

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Abstract: *This contribution deals with the influence of addiction in parents on social aspects of their childrens´ lives. It describes the scenario of addiction in the family, its impact on the family and codependence syndrome. The author´s priority was to identify the consequences of parents´ alcoholism on childrens´ socialization and to describe the influence of alcohol dependence on the childrens´ adult lives. In the conclusion of this article the author offers options of solving this issue caused by codependence.*

Keywords: *family, dependence, codependence, adult children of alcoholics*

1.Introduction

An addiction is an obsession which enslaves humans, rids them of their freedom and personal integrity. Without trying to fight to overcome it, great destruction awaits the human in their life (Křivohlavý, 2003). According to the World Helath Organisation, addiction is "The state of regularly repeated or chronic intoxication by psychotropic substances. The WHO considers an addiction an intoxication, as in, a consequence of repetitive ingestion of natural or synthetic drugs, when it shows an undeniably harmful effect on the individual, social group, or society." (Gohlert, Kuhn, 2001) The issue of addiction is worldwide. Many international - scale experts are looking for effective ways to get over an addiction or prevent it. (Fischer, Škoda, 2009). According to Gebsattel´s theory(In Längle, Probst, 1997), addiction arises as a consequence of the feeling of emptiness and impulse leading to self-destruction, which every human carries inside of them.

2. Alcohol dependence and its impact on a family

Alcohol dependence is often called an illness. Alcohol is the most used and most socially acceptable addictive substance. It is used in many social rituals. One can obtain it without difficulty, for fairly little money, and it is available most everywhere. (Straka, 2005).

WHO (In Drogy, 2014)states : „The dependence on alcohol comes in when one cannot, despite their best judgment, stop the usual excessive consumption of alcohol, or lower its intake without the apparition of abstinence symptoms.

Mentions of alcoholism and its harmful effects were made as early as in the works of Hippocrates, Aristoteles, Galeanos or Avicennos, but the breakthrough in medical perception of alcoholism occurred on the turn of the 18/19th century. In 1849, the Swedish doctor Magnuss Huss, for the first time in human history, described alcoholism as an illness with a wholesome clinical description. (Kunda a kol., 1988). Alcoholism was officially accepted by the WHO as a medical problem 100 years later. (Kalina, 2003).

The medical point of view differentiates among five basic types of addiction. Gohlert and Kuhn (2001) state:

1. Alpha Type, in which temporary mental addiction occurs, the individual does not lose control, he is though a conflictual, tipsy type, whose drunkenness causes minor familial and social misunderstandings.
2. Beta Type, typical by excessive, but not regular consumption of alcohol. The weekend or occasional drinker, not developing psychological or somatic addiction, but some somatic problems occur when consuming alcohol, such as nerve inflammation or gastritis.
3. Gamma Type, significant by the loss of control under the influence of the addictive substance, accompanied by psychological, and at a later stage, even somatic addiction. The alcoholic is still able to abstain, although the tolerance margin rises. Alcohol poisoning is regular in this type.
4. Delta Type is unable to abstain, but maintains control over the consumation, therefore excessive drinking and poisoning do not occur. This type has to drink alcohol daily, so they are almost never sober.
5. Epsilon Type is quite rare. After a couple of months, disturbances lasting more than one day occur due to compulsory drinking. Control is lost and a state of distortion occurs. These individuals tend to be clinically and socially inconspicuous.

Different types of alcoholism overlap, thus the development of the illness is marked by transitions among them.

Alcohol dependence not only influences the life of an individual, but also has a great impact on theier family, A family with an addicted member has a range of complications, relationships get disturbed among its members, divorces occur. (Vasilescu, 2011).

We differentiate three basic types of alcoholic families:

1. Families where the father is addicted to alcohol

In the present, the father is still perceived as the main breadwinner whose most important duty is to sustain the family, mainly on the material side. This means that if the father is the one addicted to alcohol, the family suffers not only mentally, but also financially and/or materially. An alcohol-dependent father does not support his family financially, instead he uses his salary to satisfy his

interests. It often happens that the father loses his job due to addiction, becoming unemployed, which is when he starts buying alcohol using the financial resources of his wife. In the behavior of an alcohol-dependent father we recognise two situations: one, when he is under the influence of intoxication, and another in the periods of sobriety. A difficult situation for the relatives starts when the addict becomes agressive in the period of intoxication, be it brachially or verbally. In the time of the father´s sobriety the family members are exposed to incessant promises, breaking of said promises, repetitive lying, evading answers, denying the alcohol problem and rationalization of the driniking. In a family like this, the mother tries to take on the father´s role. Many times, due to financial hardship, she works several jobs at a time to compensate for the financial deficit of the family, caused by the father´s alcoholism. Caring for the family and the functioning of the household are all on her shoulders. Often, she spends extra energy to deny the alcoholic´s problems and misdemeanours. She is chronically tired and overworked, which shows significantly on her behaviour, even towards her children. She is irritated and has inadequate reactions to her children and their needs. She tries to realise the situation and behave kindly towards her children, but given her state she oftentimes is left without even enough energy to smile. She is glad if the children do not have any bigger problems at school, which she would have to solve, and when she doesn´t have to pay the least bit of attention to the child. The child is often screamed at, and in case some problems appear with the child, the mother emotionally blackmails them using the family´s situation (Phrases like "Why are you making up more problems for me?", "Can´t you see I´m busy?"). The child cannot understand the mother´s behaviour, they reproach the mother mentally because they are unable to realise that her behaviour is caused by overworkedness and the tiredness and exhaustion that comes with it. A big paradox in this situation is that the child often tends to have a closer relationship with their father. The relationship with the alcohol-dependent father is not always negative. In fact, ambivalent emotions prevail : love and hate, hope and disappointment, friendliness, understaning, but also resentment, fear, refusal. The child is disappointed many times and this disappointment can lead to a lack of confidence not only towards the father, but is also generalised as a lack of confidence in the whole "outer world".

2. The mother addicted to alcohol

In our society the mother is perceived as the one who makes the househod function properly, cares for the children. If the mother is addicted to alcohol, the family suffers in this aspect, too. In a more advanced stage of the mother´s addiction, the children are neglected not only mentally, but also physically, they are dirty, hungry and go to school unprepared. The situation goes unnoticed by the father/husband, probably because of work duties keeping him out of the house and family. The mother´s duties are most frequently taken on by the grandparents, or the eldest child of the family. In the case of the duties being taken on by the eldest, premature maturity occurs, because the tasks are not ones they would normally accomplish, regarding their age. The mother realises her addiction, she reproaches herself for the arisen situation, tries to start again and live a "normal life". She seeks impulses which would mean this new start, such as painting the house or moving, or a change of personal image or profession. The addiction is habitually stronger, though, so the mother fights with repeating failure, which only reinforces her alcohol addiction. She also repro herself for neglecting her children. In alcohol-dependent women, apart from the frequent remorse, we als observe, mainly at the start, a strong tendency of hiding the addiction from her surroundings, normally they manage to do this for a quite long time. Lies, evading and denying the problem take on a bizarre form. Uhlinger and Tschui (2009) state that one out of every three alcohol addicts is a woman.

3. Both parents addicted to alcohol

According to Okruhlica et al. (1998) this is a serious pathological situation, which, paradoxically, sometimes holds the partners together substantially longer than in asymmetric pairs, where there is only one alcohol-dependent person. In this case, the partners are not bonded by deep feelings or love, but by a common passion – drinking alcohol. They realise that a different, non-dependent partner would not stay with them, whereas with this one they have feelings, problems in common, that are the center of their thinking. Even if they manage to get over the addiction and abstain, the relationship is almost always doomed. The abuse of alcohol in both partners has catastrophic consequences on the lives of their children. They are very vulnerable, mentally and physically neglected, sometimes abused. Many times, the phenomenon of parents alternating in drinking occurs.The worst situation arises if both parents drink parallelly, at the same time. The atmosphere of the family is emotionally unstable, agressivity prevails and the parents fail to bring up their children. The eldest children take care of the younger siblings. The parents´ behaviour represents a difficulty for them. In many cases this supports the siblingly cohesion, but this is not always true. They could be aggressive and maladaptive and they fail in school. Influenced by the situation, they try to run away from home, many times they show suicidal thoughts or intentions. As adults, they show mental and social problems – they get into a repetitive, vicious violent circle – men become alcoholics and girls, more frequently than average, find addicted partners again. (Bentovim, 1998).

Pathological addiction to alcohol and focus on it and its acquiring means the loss of interest for oneself in man, but also loss of interest in one´s family, their sentimental life weakens, the family is disrupted. (Višňovský, Valentík, 1989). A dysfunctional family system can create individual psychopathology, which then complicatedly affects the optimal functioning of the family as a whole.(Matoušek In Sobotková, 1997).

The conduct of a family member within the family system is affected by the conduct of the other family members. Uncontrolled alcoholism menaces the effectiviy of communication in the family, emotinal relationships crash, the family members feel loneliness, emptiness. Often, the

most important conclusion of alcoholism in the family is the children leaving at the first opportunity, although they are not ready for a self-sustaining life. (Profous, 2011).
A family with an alcohol-dependent member gradually passes from a healthy one to being a codependent family, its viewpoint on addiction changes, it passes through several phases shown by changes in the members´ behaviour and are acompanied by diverse feelings.

3. Codependence syndrome

The term codependence emerged in the 80s in the United States of America. It started being used in treatment centers in Minnesota. They used it in alcoholics anonymous groups, where the members of the addicts´ families. In the 40s, groups founded by addicts´ spouses started to arise gradually. Their main goal was to understand the system and main principles of codependence and to learn to handle situations caused by it. (Laskovská, 2007).
Either a child, adult child, adult, partner, wife, grandparent or friend can be codependent. The nature of codependent behaviour is an uncontrollable need to help and control. (Vasilescu, 2011).
Codependence is frequently the main reason why the family member´s alcohol dependence persists.
It shows these characteristic signs

1. the need of caring after others,
2. pathological behaviour
3. lack of self-confidence
4. incessant controlling and self-blame for the situation arisen in the family
5. long-time denial of the existing problem
6. predispositions for addiction
7. failing communication
8. insufficient boundary determination,
9. litlle shown confidence,
10. anger.

Jackson 1958 (In Gabura, 2012) describes the stages through which a family with an alcohol-dependent member passes

1. the family tries to deny the problem and have everything under control
2. the faimily tries to rid itself of the problem, isolating the member
3. the family is disorganised, conflictual situations and threats occur
4. the family desperately tries to find solutions, shows effort to reorganise
5. the family wants to flee the problem, the addict is isolated
6. the family reorganises by seeking specialised help
7. Alcohol dependence in a family member remarkably affects their children.

4. Helping children with alcohol-dependent parents

Pavelová (2009) states, that in the current time, very little attention is paid to the codependent. She considers the existing self-help groups meaningful groups of people trying to achieve a new quality of life. She considers elements which help weaken the feeling of isolation in people with any type of problems, while also offering emotional support, or other help mutually offered among the group members, substantial in the work of any self-help group. A significant element of the system is dealing with hardship through mutual help among people with similar difficulties. (Matoušek, 2001). In Slovakia, the self-help groups Al-Anon exist as an option of self-help. In 1935, the first of such groups emerged in the US. In these groups, friends and relatives of alcohol addicts come together to support each other, exchange experience, give each other strength to solve their common problem. The group was founded with the goal of helping families. Within Al-Anon, adult children of alcohol addicts meet because their parents´ drinking has left consequences on them. There are no professional therapists nor specialised expets in Al-Anon. They create informal discussion groups, where group members talk about their feelings, learn to work with their fear, to understand their feelings, and work together on their healing.
Another option of effective help for adult children of alcoholics is social counseling. The primary goal of social counseling should be removing the victim, sufferer, or codependent role. It is necessary to help in removing feelings of anger, hate toward the addict and fear. Within individual counseling, there are solutions to any neurotic problems, which are the result of long-term trauma or vicitmisation. Importance is mainly attributed to education in the matters of alcoholism to exclude myths forthcoming from distorted information and possible stigmatisation.
Okruhlica (1998) is of the opinion that professional counseling in the area of addiction should be left in the hands of medical workers, as in, specialised doctors working in the area of addiction,psychologists and trained nurses. Pavelová (2008) opposes this, stating that specialised social counseling aimed at the area of addiction belongs not only into the competence of medical workers, but also social workers having acquired the necessary knowledge and having the personal prerequisites to work with an addicted client.

5. Conclusions

Children who, in the family of an alcohol addict, are constantly injured and ofttimes confused by what´s happening around them, protect themselves by lying, denying and hiding their feelings, and evading close relationships. The addiction of the parent greatly affects the child´s self-confidence. The child is not capable of social contact and constantly blame themselves for the pathological situation in the family. The lives of children with parents addicted to alcohol are affected even into adulthood. They have low self-esteem, feelings of inferiority, they are unable to finish tasks. They have a big problem relaxing in company, which stems from their high levels of self-control, and an inability to confide in other people. They use the form of defense, acquired in childhood and adolescence, in adulthood, without realising it. (Šavrnochová, 2011). It is necessary for children of alcohol-dependent people to get adequate help and could thus fully live their life. In our society, though, we do not yet realise the need of help for children who, during their

whole life, have suffered due to the alcohol addiction of their parents. It is necessary to support specialised education of competent people working in this field. It is also indispensable to get a multidisciplinary team into their treatment, consisiting of a social worker, a psychologist and a psychotherapist. Systematic implemetation of specialised teams into practice can perspectively influence not only the mental health of alcoholics´ children, but also diminish the risk of addiction in families they will further create themselves.

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QUANTITATIVE AND QUALITATIVE APPROACHES IN THE DISSERTATION RESEARCH

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Abstract: *The text is focused on drawing peculiarities of individuals from Juvenile Detention Centres (JDC). Mixed research is focused on the research questions and hypotheses dissertation. This text focuses on motivations and spontaneous artistic expression of the delinquents. Through the art creation one opens himself up to others and reveals his secret sides. The aim is also to find out what is the nature of the drawing process in troubled individuals*.

Keywords: *mixed methods, research questions, research hypotheses, Juvenile Detention Centre, drawing process*

1. Youth with Behavioral Disorders and Significant Education Problems in the Process of Drawing

The puberty brings about plenty of personality changes. Turning inward into one's own world, especially one's own self, is a typical feature of an adolescent. Such thinking, through all criticality, is usually ruled by emotions, moods and desires. According to Cacka the age of puberty is a period for the frequent occurrence of adverse reactions like lies, slanders, frauds, fights and the like [1]. He also describes this period as a lust and hunger for life, which is an expression of the natural need of broadening one's experience horizon. He mentions the huge danger of stumbling on the road to adulthood by which he means an immature attitude of the whole personality. Mental instabilities, social and ethical deformations take place often during adolescence and that might cause the occurrence of behavioral disorders that can indicate the future delinquent behavior of the person. The person has to face various types of mental burdens whether they are exams in the school, stressful moments or conflicts in themselves or in relations with people around and family. Strigacova as well mentions personality problems and among them she considers membership in gangs, alienation from family, drug addiction, alcoholism, drug dealing, tendencies towards violent behavior, low IQ or mental disorders (not feeling responsibility, deviations, etc) [2]. The mentioned factors can be understood as some kind of signal of the future delinquent behavior of the adolescents.

1.1 Spontaneous Artistic Expression as Self-Expression

The individuals' spontaneous drawing expression has become the centre of attention. Further I examines the artistic expression that accompanies the spontaneous individual's expression. The meaning of spontaneous expression lies within the present moment, which is being experienced by the creator. Therefore the author seeks the answer to the question, what the young delinquent is experiencing during the process of his artistic formation. By spontaneous artistic expression we mean a creative activity that is not directly or intentionally encouraged or stimulated by another. It is about an impulse which arises from the internal needs of a person who decides to creatively and artistically respond to external and internal stimulus. A spontaneous expression is related to the artist's relationship to reality and that is why this artistic form does not require a true presentation nor respecting proportions nor precision regarding details, it is about expressing the artist's essence. This is also about being able to reach one's deep feelings and experiences. At this moment, the artist authentically devotes himself into his own perceptions and the art form. A spontaneous creation is about the artist focusing primarily on capturing his current mental state, impressions, feelings and moods, thoughts or his attitudes. Problematic children from JDC are not mentally ill, however are different from ordinary young children. According to one nurse problematic children are "Emotionally Handicapped". They experience internal conflicts, conflicts with their loved ones or with their surroundings. They are rebellious, they feel under pressure and are frustrated. Many of them already at their age have gone through so many experiences and have so much life experience, that an adult could be astonished by this. In my opinion their experiences then express their distinctive and impulsive incentives in their self-expression, thus it is helpful for them to express their personality through art activities.

1.2 Motivational Process for the a JDC to Provide Drawing Expression

The essence of drawing expression is based on motivation. The drawing process is the action of both external and internal forces as well as the person's interaction with the group, their environment or their ideas. Good conditions must be created for the drawing process of an individual. Motivation for drawing expression should be in a friendly atmosphere and should stimulate the troubled individual for creation, not dampen them. Unrest and noise at the beginning of creation is never beneficial and it rather leads to anxiety and suppresses the drawing expression. Also negative influences made before the drawing might cause a state of anxiety, leading the artist to superficial expressions and the final works a sign of parody. If we know that the individual is not totally in the mood for a drawing process it is not appropriate if they are actively forced into it. Motivation and the drawing process should be created without prejudices that the individuals would commit something during the activity. There should of course be

some supervision over the wards but only to the extent that safety measures do not disrupt the drawing. To make the drawing process authentic and identical to the artist's perception it is necessary that the drawing person not have a feeling they are being watched over, observed, controlled, corrected and warned. If the individual draws under pressure and the motivation is somehow based on an order it is sure that the individual will rebel in their drawing expression, be influenced by disgust caused by the task and the result may appear to be an expression of defiance. Read thinks that when the adolescent draws anything under someone's influence or guidance they draw especially for themselves, that they should follow their own hidden aims and that "It is about the independence of their activity firstly provided." [3] The key person for the drawing process is therefore the coordinator of the whole process, who controls the atmosphere during the activity, motivates, stimulates and praises the individual, regulates unconforming behavior, gives space to free expression, communicates with the individuals, gains feedback from the task and evaluates the results. It is necessary for the coordinator of a drawing event to be able to create the right atmosphere. "If they are to create a free creative space around them they, at the same time, have to suppress personal opinions, not impose their ideas or art opinions." [4] It is necessary to create such conditions that they become a source of motivation. Not only a friendly and creative atmosphere but also the name of the drawing task will become a motivation. A relaxation exercise before drawing is usually beneficial and helps one to calm down and think about one's feelings and thoughts. An individual should understand motivation and drawing as a relaxing creative activity that will enrich their knowledge. It is also supposed to detract from destructive tendencies and play a significant role in overcoming mental troubles [5]. The coordinator of a drawing activity should choose proper words, sentences and questions. It is a crucial mistake to look down on the individuals and talk extremely correctly during the motivation. The attention of the wards cannot be gained like that. As well as that, it is necessary to organize the drawing activity and adapt the environment in a way that the individuals will feel relaxed during their drawing. The wards should not sit in the way they sit at school desks and they should draw at one table and the coordinator should sit next to them. They should in no case stand above them. Motivation not only for drawing process but also for finding one's own identity through creative activity is not supposed to be an effort for a perfect result, but a tool for understanding troubled individuals.

2. Formulation of the Research

At the center of the research is the youth who has a difficult temperament and grows up in educational institutions. The aim is also to find out what is the nature of the drawing process in troubled individuals. My aim is to find and point out specific drawing originality, signs and symbolism. It is focused on the artist themselves, their distinctive drawing message and the creative process. I also watch the behavior and attitude of the tutors and supervisors during the creative process of the youth. The research work includes a variety of views on respondent's visual art submission. This research specifically addresses questions of how conduct disorder among adolescents is reflected in their drawing expressions, what affects the youths during their artistic process and how they can work with drawing tools. The main aim was to conduct Art meetings / Art Therapy, which allow me to monitor the distinctive artistic expression of an individual who has fixed and repetitive inappropriate behavior. The purpose of the meetings is to listen to the authentic testimony, which reflects the current mental state of the youth from the JDC. This paper also summarizes current results of this research for this thesis. This dissertation work is focused on children and adolescents with conduct disorder. I would like to put emphasis on the art meetings where their main purpose is to motivate the artists to create a spontaneous drawing, then watch these respondents during their artistic process, make subsequent conclusions that can be drawn from the art meeting and then make an interpretation of the distinctive artistic expression. This artistic expression can be seen as an instrument through which we can get to know and understand the problematic individuals who show occurrence of conduct disorder or frustration. The drawing activity or any other artistic activity in the end becomes a means of communication between myself and the respondent. I emphasize that I do not intend to diagnose an individual, I have no authorization to do such a thing and I do not wish to evaluate or judge anyone. The purpose of this thesis is to acquire authentic testimonies of the problematic individual or an individual in the delinquent perspective, where his current mental state, thoughts, experiences or interests are reflected. Another aim is to highlight the artistic features, the artist's hand moves, dynamics, tempo, graphic elements and symbols. The research was launched in October 2013-2015. Part of the research actions is to evoke the creative atmosphere and good motivation to artwork. The respondent has to feel relaxed during the process of drawing. The length of the research action is going to be 15 to 20 minutes. The drawing is oriented on 43 troubled individuals.

2.1 Design Mixed Methods Research

The mixed research identifies the quantitative and qualitative data which are analysed and presented separately. Explanation of the mixed research: 1. Subject of interest – Children and teens with behavioral problems, the drawing process of problem individuals and their characters and symbols in the artifacts, reflection of artistic communication, communication and the relationship between the respondent and the teacher. 2. Object and purpose – Provide recommendations and information about approaches to children and adolescents with disorders of behavior in art activities, insight and understanding of the speech on the authentic drawing individuals with behavioral disorders, provide a valuable source of interpretative practices not only for educators or therapists but also for parents, point out the reactions and behavior of teachers during the drawing of the activity, the use of communication and reflective dialogue as a tool of cognition of children and adolescents with behavioral

problems. 3. Definition of the research environment – Three Juvenile Detention Centres / Czech Republic (Data collection was carried out also in kindergarten, elementary school, middle school, the grammar school, orphanage and also primary and secondary school for mentally handicapped children and adolescents. The research sample contains 125 drawing artifacts). 4. Definition of the research sample – Children and adolescents with behavioral disorders living in JDC, 36 respondents aged from 12 to 20 years. 5. Qualitative research – A research study of the creative environment/creative atmosphere, the drawing process and the motivation to create. 5.1 Observational studies – Monitoring of the phenomena that affect authors throughout the research objectives. 5.2 Interpretation – Interpreting and evaluating the drawing processes, resulting products, effects of the atmosphere and the behavior of the respondents during the creative expression. 6. Quantitative research – The General hypotheses and opinion.

2.2 Research Questions and Hypothesis

Research Questions: 1. How can we detect the reflection of contrived violation of standards, deranged or deviated behavior in the expressed features of the drawings? 2. What are the most common drawing elements and their symbolic interpretation? 3. What kind of an attitude has a person with conduct disorder towards his drawing and the given task? 4. How does he use drawing tools to capture his current mental state, memories, experiences and wishes? Quantitative research / General hypotheses and opinion: H1 – What are the differences in the drawing spontaneity of a troubled individual depending on the presence/absence of a tutor during the drawing process? H2 – Is drawing spontaneity and the candid drawing expression of an individual with education problems a reflection of their values, attitudes, thoughts, opinions and current mental condition? Opinion – Is it truth that "[…] when it comes to children with behavioral disorders the drawing has less motives, details and colors, depressive children often using dark colors, mostly black and brown? " [6]

3. Drawing Process in Mixed Research

The center of the experiment becomes a drawing task. The essence of the drawing task and motivation is also invoked by the respondents to the memories of family, loved ones, friends, home, neighborhood, nature, experiences, etc. The author has seen the association of motivation and creative task. The drawing task is to open the contents to a personal experience of the authors. "Drawing should be an activity performed without effort, it should rather be desire than a reluctant effort." [7] The research is split into two groups. Group A will consist of 18 respondents who will draw under the supervision of a tutor and also the following drawing tools will be offered to them: papers, crayons, pencils, rubbers and sharpeners. Group B consisting of 18 respondents will express themselves by drawing without a tutor's supervision and be offered only pencils and papers. It is assumed that Group A will be more nervous, uptight and use the offered tools more often. Group A – The drawing process in Group A took place in the presence of tutors. Safety precautions were exceedingly provided and the creative atmosphere was becoming more like a "prison". The beginning of the creative atmosphere did not go well. Some of the tutors did not make a positive impression on the respondents by mocking the respondents. The respondents did not protest but started to be bored and disgusted. They also started the drawing process so as the not to be given a punishment. It means the respondents drew because they were told to by the tutors. They did not draw on their own initiative. They did not enjoy the drawing and the creative activity brought them no satisfaction. They did not show interest in creative activity. Some of the drawings had some parody in them; they were not personal, original and seemed to be forced. The drawings were dirty, very easy and linear, without a story, the characters were bizarre and nonsensical as well as the perspective. The respondents erased and re-drew the drawing lines more often. They were nervous during the drawing process. Some of them suppressed anger, which was visible on thick drawing lines. Group B – The respondents who were drawing without supervision or the presence of a tutor or in a room with not such a large amount of security measures did not re-do their drawings, did not erase and their drawing expression was more confident. A more positive relation to the creating process could be observed. The respondents were more communicative. They were pleased by the drawing task and were able to dive into the process more. Fantastic and fairy tales motifs occurred. Some of them had a sense for the elaboration of details. The artists tried to talk about what they were making up and what they were drawing. Interest for drawing and fine art was aroused among the respondents. In this case it was found that drawing spontaneity and honest drawing expression without parody, defiance or disgust took place in the absence of a tutor. The wards were more open in both art expression and communication. They used a reflective dialogue on their creations. During the drawing process they did not need a rubber, did not re-draw the drawing lines, the drawings full and the creations joyful.

3.1. Reflection on the Gained Data

The drawing process of a troubled individual is more relaxed when the relations of the ward with their tutor are positive, friendly and security measures are not too strict. Security measures should be at such an extent not to discourage artistic creativity and not intervene in the concentrated artistic process of the artist. Drawing spontaneity depends on the relation of the artist with behavioral disorders to the tutor. When the presence of the tutor intervenes in the drawing process or any creative impulse of the ward, relaxed drawing, a distinctive artistic message and original artistic expression cannot be expected. The assumption that the respondents will be more nervous and uptight during the drawing process in the presence of a tutor was proven true in the case when there were more tutors or negative relations between the tutor and a respondent prevailed (see Table No. 1). Spontaneous drawing and candid drawing expression of the artist becomes a reflection of their values, attitudes,

thoughts, opinions and mental condition (see Table No. 2). Moments during the creation with an artistic tool left permanent marks (in the form of an artifact, lines and pencil strokes, traces after the drawing, etc). The claim that a drawing by children with behavioral disorders usually contains less motifs, details and colors is not completely right. Drawings poor in motifs appeared only in Group A (drawing process in the presence of a tutor). However, the respondents who were relaxed, focused and not under pressure were able to grasp gained experiences and their emotions through drawing. The respondents felt the need to say something about themselves through a drawing tool (pencil). They perceived their drawing as writing a letter for a close person but the text of their thoughts was hidden in symbols, motifs, artistic handwriting, tempo and the entire presentation (see Table No. 3). Some individuals clung to details and their drawings were sophisticated. Precise drawings also appeared. As for the claim about depressive children it is correct. It was observed in the research that depressive unstable individuals or individuals with suicidal tendencies blurred their drawings with their fingers, blackening them.

Table 1 Comparison of the drawing process of groups

	Group A	*Group B*
Dislike and uncertainly from drawing	82 %	21 %
Relax and joyful from drawing	22 %	81 %
Spontaneous drawing	11 %	82 %
Emotionality during drawing	32 %	79 %

Table 2 Drawing expressions of individuals suffering from behavioral disorders

	Groups A and B
Blacken and shady drawing	28 %
Incomplete details	18 %
Poor drawing	36 %

Table 3 The most common drawing symbols in the drawings of troubled individuals

Symbols in the drawings	*Drawing in JDCs*
Symbols of TV	28 %
Act of defiance	20 %
House	70 %
Fence	26 %
Portrait	10 %
Nature	45 %
Fabulous creature	23 %
Figure	28 %
Marijuana	43 %
Sun	47 %
Car	22 %
Highlighted eyes	5 %

4. Conclusions

Physical constitution, mental constitution, individual characters and also the external environment influencing the artist were reflected in the drawing expressions. The values of the respondents were also reflected in the drawing symbols. We can understand the drawing expression as a picture language and with this language the artist talks about their feelings that fulfill them. The research has shown that an individual with behavioral disorder expresses themselves by drawing in an environment where there is a friendly and relaxing atmosphere without pressure and strict artistry. If there is pressure put on an individual, many disciplinary measures taken or if the relation between the individual and tutor is negative it is almost completely clear that the individual will resent fine art and drawing. It turned out that art has a positive influence for troubled individuals. The assumption that drawings by individuals with behavioral disorders are poor on motifs and details was disproven. On the other hand, the individuals have a rich imagination; they can think about their drawn motives and further develop them. Poor, styled, childish and naive motifs appeared when the artist felt under pressure, anxious and afraid of punishment. In any case, the artists projected their emotions and personality on their drawings. Their drawings became a reflection of all their desires, thoughts, attitudes, experiences and opinions. They displayed their values in their drawing expression and they are visible in the drawings. A relatively major part of the respondents were able to draw what has value for them and what they are not indifferent to.

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INFLUENCE OF FAMILY ENVIROMENT ON ADOLESCENT DEVIANT BEHAVIOR

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Abstract: *The paper focuses on family environment, social deviation and socio-pathological phenomena. The contribution contains the results of a qualitative research study which we conducted using semi-structured interviews in a re-education facility; sampling was purposive. The research results confirmed that disharmonious environment, poor emotional bonding and neglectful parenting styles have an impact on the deviant behaviour of juveniles.*

Keywords: *family environment, social deviation, socio-pathological phenomena*

1 Introduction

The period of adolescence can be considered as the most risky period in the life span. The young persons' opinions, attitudes, values, overall behaviour and moral habits are formed. Healthy mental and physical development depends also on the family an individual grows up in because family is one of the most significant factors for individual's personality development. Family is of a great significance for each of us. It affects our lives not only in the period of childhood; it is significant also in the periods of adolescence and adulthood. Families differ from each other, they can mean something different for each of us. Aggression, alcoholism, disinterest and a lack of care from the next of kin cause the feelings of uselessness, helplessness, hopelessness and rejection in young people, which can result in their future deviant behaviours.

1.1 Family environment, social deviation, socio-pathological phenomena

A family in which children and adults feel loved, accepted and safe is a kind of a safety island which provides space for healthy self-development and full life.

Functional family formed and developing according to standards and mechanisms of the solid of the community as a maintained and an informal group of the institution has the best conditions for establish a suitable environment for the formation of healthy personality of man and to become the prevention deviation in the company [7].

If a family does not fulfil its functions, it is disharmonic. Typically, such a family cannot meet the basic needs of its members; its climate is full of tension, dissatisfaction and frustration; often there are also hostility and violence. In such an environment, norm violation is rather common, which results in behavioural deviations in the family members.

The characteristics of a dysfunctional family include: internal family relationships are affected by the atmosphere of distrust; behaviour among family members is unfriendly; responsibilities are unclear; communication between family members is full of contradictions, misunderstanding and vagueness; there are many negative emotional relationships; hopelessness and despair are dominant; there are problems with general household functioning; upbringing of children is neglected; and there is a lack of adequate care [8].

In individuals, inadequate family environment can result in violation of the social norms and the rules valid in the society and community. Deviations from norms can vary in forms, intensity, levels, and causes. The main concept in this context is *deviation*.

Social deviation is a way of behaviour which does not fit the social norm but it is accepted by the majority of population. Deviation is defined as any divergence from normal structures or functions [10].

As deviant behaviour is defined as a divergence from the norms valid in the society, we define the concept *norm* as well. We can understand a norm as an institutionalized and specified value or rule which is obligatory and enforced [2].

Natural part of each society which guarantees the possibility of liberal actions is such behaviour of its members which can be considered undesirable, unwanted, refused, and unacceptable. They are the phenomena that are present in the society but which are perceived as unacceptable, and we try to prevent them.

Social pathology deals with the principles of behaviours which the society perceives as undesirable because they violate legal, social, or moral norms [4].

Socio-pathological phenomena are socially undesirable, cause harm, and violate the society we live in, as well as its specific individuals; not only those individuals who are threatened by pathology and become the victims of undesirable actions, but also those who conduct it directly, so those whose behaviour is considered deviant. It is good to realize that socio-pathological phenomena are a result of the society, i.e. what the society considers undesirable and

abnormal in the given historic, social and political contexts [2].

Socio-pathological phenomena are present in each society and they reflect health of the society. Of course, if they are maintained in certain limits. Undesirable behaviours can be maintained in acceptable limits by sanctions and prevention. Prevention is considered the most effective and efficient tool to fight socio-pathological phenomena.

2 Methods

In the survey, we focused on family environment influence on deviant behaviour in adolescent girls. We studied the areas which focused on influence of parenting styles, physical punishment, disharmonic family environment, and the failure to meet emotional needs. For the purposes of this paper, we discuss parenting styles in the chapter focused on the results.

To study the issue, we used the qualitative survey; methods in this survey provide deeper understanding of social phenomena than would be obtained by the use of the quantitative survey [11].

Data were collected in the re-education centre in Zlaté Moravce by semi-structured interviews.

A researcher has a prepared content framework, a list of questions, but the questions are adapted to the interview development, which means that he/she can use new questions and omit those which do not fit. The fact that the semi-structured interview is limited to some extent allows thematic concentration, which makes the data collection more efficient than non-structured interview [1].

We recorded the participants' answers on a dictation machine, and then we used them in case studies.

Sampling in the qualitative survey as purposive to match the survey objectives. Based on these backgrounds, the sample is purposive, purposefully selected [1].

The basic criterion for our sample was being a resident in a re-education centre. The sample included ten 14-16-year-old girls.

We used three methods in our survey. The first method was an interview which is the most advantageous method to obtain qualitative data [9].

Another method that we used was the method of content analysis of the documents that we were provided with. Documents can provide a data background for the study or they complete the data obtained in interviews. He differentiates between personal documents, official documents, archived data, mass media information, and virtual data [3].

The last method that we used was a case study which is a scientific analysis of a specific case. Mostly, it is used ex post, i.e. after data collection. It is a method of scientific studying of reality, whose objective is scientific generalization of the information obtained by systematic analysis of individual studies [5].

The method of a case study includes the use of multiple methods such as observation, interview, questionnaire, analysis of activity results, or anamnestic methods. Basically, it collects all data about an individual available, and then it sorts, systematizes, analyses, compares, and chronologically classifies them; it also detects relationships, connections, characters and nature of the signs or characteristics, and developmental trends and anomalies [12].

In the case studies, we focused on detailed descriptions of participants' family conditions. Specifically, we focused on demographic, material, psychological and cultural conditions of family environments.

3 Survey results

In the first participant, the preferred parenting style was inconsistent, even neglecting. The minor's parents are divorced; her mother has worked mainly abroad, so her grandmother took care of her most of the time. The minor said there was a lack of love and praise in her family. Inconsistent parenting by her mother resulted in the situation that the minor is not able to manage her emotional habits, solve conflicts, respect the rules, and bear the responsibility for her actions. It resulted in the problems such as truancy, thefts, tobaccoism, alcohol abuse, and disrespect to authorities.

In the second participant, there was a double standard in parenting; her father was authoritarian and her mother was liberal. The minor perceives her parents differently, which could be seen in her responds in the interview where she stated that she got on rather well with her mother, but it was different with her father. She respects her mother because she praises and appreciates her more often; her father uses authoritarian parenting and she says that his behaviour towards her is inadequate as he often used physical punishment and restrictions.

In the next participant, there was a liberal, even neglecting parenting style; there was a lack of authority in the family, and behavioural problems occurred. Specifically, a lack of authority means a lack of mother's authority who did not have a stabile position in the family, particularly in the relationship to the minor. The mother concealed her daughter's misdemeanours and did not deal with them. Based on the information from the documentation we studied, the rules and limitations were not given by the mother, but by the daughter. On the other hand, she realizes that she does things she should be punished for but she is not. It proves that there is liberal, even neglecting parenting in the family, which results in wrong life habits. Minor's behaviour which resulted in truancy, crime and behavioural problems is a result of mother's limitless parenting.

In the next participant, liberal parenting prevailed. It was manifested also by the situations when the minor did not obey the rules and came home several hours late, and her mother encouraged such actions. In the minor's documentation we found out that mother's parenting was affected by liberality and inconsistency.

In the next case, a double standard in parenting was used; a mother was authoritarian and a father was liberal. The minor describes her relationship with her parents as not a very good one, because her mother often punished her and her father spoiled her and gave her money whenever she wanted. Her mother punished her and forbade the things. Her father did not use such authoritarian methods as her mother did; on the contrary, he was too liberal and he,

basically, bought his daughter's interest and obedience. The minor perceived her father's behaviour as rewarding. These failures result in disrespect for social norms and inner defiance which is manifested particularly by passive aggression, which resulted in minor's deviant behaviour which was manifested by truancy, thefts, early sexual activity, and excessive interest in the opposite sex.

In the next participant, there was inadequate, even neglecting parenting. It was neglecting on the mother's side and authoritarian on the mother's partner's side. The minor did not respect her mother as an authority at all, and she lied to her constantly. At first, her mother supported her but later she admitted that she lied to her. Her mother's partner was often aggressive and used physical punishment against the minor and her brother. So, from the mother's side we can talk about neglecting parenting and failure to meet the minor's needs. From the mother's partner's side, authoritarian parenting was preferred with a tendency to physical punishment and inappropriate sexual behaviour towards the minor.

In the next case, there was liberal and neglecting parenting by a mother. In childhood, a grandmother looked after the minor because the mother was not able to do it. The mother was not able to provide a stable family environment for her daughter. The minor stated that she considers her mother's parenting methods as adequate even if she punished her often, according to her; now she realizes that she did it for her. The mother was not interested in her daughter very much in her childhood, that's why her grandmother took care of her. This neglecting parenting by the mother resulted in truancy, rude and aggressive behaviour, and disrespect to authorities both at home and school. There was no father to provide a role model.

In the next participant, there was neglecting, even inconsistent parenting. The minor does not have a close relationship with her mother, and does not respect her as an authority. She likes her father better and would like to live with him. There is a tension between her and her mother. She does not visit her daughter in the re-education centre and writes her only sporadically. The relationships with her father are better, their contact is more frequent. In the family, the minor would need a bigger authority than her mother is. Such parenting caused that the minor consistently breaks the rules and has a lack of respect for authorities.

In the next case, inconsistent parenting dominates. A father left the minor in her childhood and nowadays he is not interested in her. A mother and her partner said they took care of the minor but she did not respect them at all. That's why we deduce disrespect for authorities in the minor. The parents failed. The mother used to pick up her daughter from school, but when the daughter saw her, she ran away and came home late at night. The minor's behaviour defies the principles of good behaviour; she does not respect her mother or teachers at school. Such inconsistent parenting and a lack of authority in the family resulted in truancy, thefts, and early sexual activity. In this case, authoritarian parenting dominates along with physical punishment by the biological father and later by the stepfather. From the mother's side, it was inconsistent parenting.

In the last participant, there was authoritarian parenting by her father and inconsistent parenting by her mother. Her childhood was affected by physical and psychological punishments by her biological father. When the mother left for work, the father kept her closed in a room for hours. The minor does not have a good relationship with her mother. The mother's new partner also used punishment in the minor, so authoritarian parenting dominates also in him. The minor respects the mother's partner and she has a good relationship with him, according to her.

4 Conclusion

Based on the analysed and interpreted results, we can state neglecting and liberal parenting styles dominated in the participants' families. To sum it up, in six participants there was neglecting, even inconsistent parenting. A double standard in parenting occurred in four participants. In our case, a double standard parenting means that one of the parents was liberal and the other one was authoritarian. In some participants, authoritarian parenting was accompanied by physical punishment, mostly by a father or stepfather.

There was liberal parenting style in six participants; for this style is characteristic a parent's passive approach towards parenting and insufficient guidance for children. A lack of organization and security, and inadequate effectiveness of parenting are typical for this parenting style. Relationships between parents and their children are too vague and the limits are not set [6].

We agree with it, because there were the indicators stated by the above-mentioned author in the case studies with the liberal parenting style. We can say that there is not only one parenting style which influences deviant behaviour but there are several of them. They include authoritarian, liberal, neglecting, and inconsistent parenting styles. These parenting styles dominated in the participants, so we can state that they influence deviant behaviour in adolescents. However, these results are valid only for the studied sample and cannot be generalized.

Parenting is a multiform, complicated and mutual process in which there is not one donor and the other recipient; but everybody's actions and thinking are mutually influenced and depend on each other. Parents influence children, positively or negatively. If parents respect and understand their children, give them love, meet their needs, allow spontaneity and freedom, and support creativity, we can evaluate such parenting as an act encouraging children's personalities. In our case, parenting can also be a deforming process if parents use inappropriate methods, if they understand punishment as revenge for wrong-doing with the aim to cause psychological or physical suffering in their children, if they limit children by orders and restrictions, and limit their freedom.

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CROSS-GENERATIONAL LEARNING AND CROSS-GENERATIONAL PROGRAMMES

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Abstract: *The paper deals with the topic of cross-generational learning, mainly aimed at cross-generational programmes. At first the basic terminology is explained. The paper is focused on particular manifestations of cross-generational learning and cross-generational programmes and their mutual interconnection which are illustrated through specific examples, reflecting the Czech situation. The conclusion of the paper brings the reflection of new options and relations of the Czech interpretation of cross-generational learning and programmes, as a support for the cross-generational educational aspect in the society.*

Keywords: *Lifelong education and learning, cross-generational learning, cross-generational programmes*

1. Introduction

The society is composed of individuals of various age categories, we speak about various age groups, cohorts, orgenerations [7]. In everyday life these groups come into reciprocal interactions with various level of intensity and these interactions form cross-generational relationships. In this interaction there is a transfer of knowledge, skills, attitudes, values, experience or other information from elderly subjects to young subjects, and vice versa. Thus it can be assumed that members of different generations learn from one another in various contexts and environments. The typical example of such learning is the environment of a family (among children, parents, grandparents, relatives), of a workplace (among senior experienced employees and juniors). Cross-generational learning also takes place in education, or in the care providing system.

2. Defining the basic terminology

2.1 Lifelong education and learning

It deals with the functional formalized as well as informal activities, associated with learning. These activities are realized continuously and focus on improving knowledge, skills and special requirements. It is a continuous lifelong process which supposes completing and pervading the forms of education given above. The contemporary preference of term lifelong learning to term education is associated with the responsibility to get and to develop skills and abilities, knowledge and competences of an individual. However, the lifelong learning is only linked to the issue of the time specification, thus an updated term life-wide learning has been implemented, involving the education at its diversity of activities of an individual´s life. Lifelong leasing is divided into two phases, they are the primary education and further education [6].

2.2 Cross-generational learning and cross-generational education

This term involves various educational processes, present in the contact of individuals of different generations. It is the intentional and unintentional, conscious and unconscious, formal and informal learning. It always appears in the interaction between individuals of different age, i.e. in families (among children, parents and grandparents and other family members), in school (between teachers and students), at workplaces (between junior and senior employees and superiors and the like) [6].
The aim of the cross-generational education is to prepare suitable and functional cross-generational environment so that the young and the old individuals had the equal conditions to share their opinions and attitudes with others. Cross-generational education is an interdisciplinary field which is not firmly anchored in scientific branches. It uses the knowledge of andragogy, applies the principles of geragogy and gerontology (especially the social gerontology). Cross-generational education is further based on the knowledge of academic pedagogy, sociology and psychology.

2.3 Cross-generational learning concept

It is the concept which is considered to be *"the collection of theoretical, research and applying knowledge and activities which are focused on creating the benefits from the cross-generational interactions. It is meeting and sharing among people of different generations."* [7]

2.4. Cross-generational programmes

These are programmes in which mutual learning and enriching between members of both young and old generation take place being beneficial for the individual as well as the whole society. They are carriedout with the aim of prevention against cross-generational tension, age segregation and elderly age stereotypes. These stereotypes mean an opportunity for children to understand age diversity in society and cultivation of their own attitude towards elderly age. Cross-generational programmes thus support the development of generation intelligence and help to bring up children to be able to accept their own ageing [8].

3. Cross-generational programmes issue

The first cross-generational programmes appeared as early as 1960s. They were originated as reflexion to social changes which have been characteristic by among others growing social and cultural gap between young and old generation.

Diversity in particular concepts of cross-generational programmes lies in various aspects, e.g. which target group they are aimed at (programmes for grandparents and their grandchildren; programmes for the elderly and children who do not know each other etc.) Among other aspects are the number of participants (e.g. programmes for several individuals, others for bigger groups etc.) and target age group (programmes for pre-school children to adolescents, programmes for the elderly). Programmes aimed at the elderly population are adjusted to this target age group (programmes for healthy and active senior citizens, others for immobile people, etc.) Cross-generational programmes vary according to purpose, target, content, place of carrying out or provider, frequency of interaction among members of various age groups, then according to length and time of carrying out.

Herrmann et al. suggest dividing cross-generational programmes according to a form of interaction among members of various generations into three common types: programmes in which the elderly are beneficial for children (teach them), programmes in which children are beneficial for the elderly (escort them etc.), programmes for mutual cooperation between both generations [8].

4. Examples of cross-generational programmes in practice

An international programme *Nature for Care* (Nature as a bridge between generations) unites the elderly and children together taking part in these activities, which are aimed at nature and ecology. The goal of this programme was to „create a functional model of environmental education of pupils and the elderly". The „Chaloupky" (little cabins) community targeted their activities for children and the elderly on herbs recognition, making products from them, and memory training as well. This project took place in Přibyslav, Velké Meziříčí and Náměšť nad Oslavou. Several meetings of the elderly and elementary school children were organised [4].

3 G Programme – Three generations is organised by a non-profit organisation Hestia. The aim of this programme is to enhance and mediate cross-generational co-living. The implementation team composed of social workers and psychologists. This programme was based on the principle of friendly relationship of a child (usually of pre-school or school age), from a family which do not have their own grandparents, with a volunteer of 50+ generation who does not have grandchildren or is not or not able to contact them on regular basis. These participants take part in free time activities together once or twice a week. It might also relate to looking after children, giving extra lessons or accompany children to after school activities, which help family functioning. Requirement for this program was to undergo initiate training. Supervision taking place every month and was compulsory for the participants was included in the programme [3].

Another example of a different type, which is aimed at the elderly benefit for children is a programme of the same organisation called *„Pět P* (*Pomoc, Přátelství, Podpora, Péče a Prevence*)*"*(*help, friendship, support, care and prevention*), in which an adult volunteer meets a child with school issues, such as behaviour or learning, because there is a lack of support in the family whatever the causes might be [3].

Experimental university for grandparents and grandchildren has been organised every year since 2004. It is the only one targeted on family members. Within this cross-generational programme children and their grandchildren are able to study together on academic ground. Children are aged 6 to 12 and there are around 25 and enlarge their general knowledge. The lessons last 90 minutes and take place in Prague on Saturday morning once a month from October to May. The elderly take the role of supervisors and the children discover new disciplines and knowledge. All lectures deal with the same topic through whole year. At the end of each school year a summer camp is organised aimed at topics connected with the year lectures [1].

Among other Czech projects is also a project called *„Adoption of the elderly"* organised by Maltese help. This project deals with volunteer help and psychological support of the senior citizens and disabled persons. Participants of this project are volunteers, mainly students of secondary schools or universities meeting their „adopted„ person for an hour or two once a week. The volunteers are instructed before entering the project. This service is also available for the elderly who are lonely, live alone or in senior homes. The parallel aim of the project is creating a relationship in which the volunteer arranges connection with the outer world for the elderly becomes their companion and helps them with personal errands. This project thus helps the elderly with new social contacts [5].

5. Conclusion

The outcomes of the surveys show that the Czech Republic doesn´t pay enough attention to prevent the presence of age discrimination and cross-generational animosity. Fortunately, the society is aware of the problem and the issue of cultivation and development of cross-generation relationships and programmes aimed at this issue focus in the Czech Republic is about to start its journey. Finally, it is necessary to emphasize the activity and cooperation of educational politics, i.e. the developing the curriculum in respect of the lifelong education which has a significant impact on supporting cross-generational aspect in society and development of cross-generational education.

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DEVELOPING VALUE SYSTEM OF YOUTH THROUGH PARTICIPATION IN VOLUNTARY SERVICE

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Abstract: *Volunteering constitutes one of the most important pro-social activities leading to higher social and human capital in society. It is also clear that levels of volunteering vary a great deal across cultures and countries due to the millions of people involved in helping for free. Helping others is the way to higher individual well-being and better impact on solving social problems. The paper discusses theoretical consideration about why volunteering might influence self-development of youth as well as the results of research aimed at human values forming by doing voluntary service in Slovakia. The second part of research is focused on relationship between community based learning / lifelong learning and carrying voluntary service and its importance for youth development and achievement of life abilities.*

Keywords: *active citizenship, volunteering, human values, youth*

1. Introduction

Baková points, that as the first in the history of the importance of volunteering mentioned by Alice Salomon.
Voluntary service brings the opportunities for the youth to develop instrumental and interpersonal skills through their work with community organizations, a form of learning that could be deepened and expanded with strategy of community based learning and active long-life education.
Lifelong learning may be broadly defined as learning that is pursued throughout life: learning that is flexible, diverse and available at different times and in different places. [1]
The European Commission (2001) found that lifelong learning has "Four broad and mutually supporting objectives: personal fulfilment, active citizenship, social inclusion and employability/adaptability". In this regard, lifelong learning has lifewide dimensions that transcend narrow economic and vocational aspects [3].
The European Lifelong Learning Initiative defines lifelong learning as "…a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they will require throughout their lifetimes and to apply them with confidence, creativity and enjoyment, in all roles circumstances, and environments." [6]
Volunteering allows young people to active in their communities and communities empowered abilities to succeed. This link between voluntary service and community partners is an element of supporting development and community-based learning offering youth ways to develop the skills and knowledge necessary for success in adulthood. The aim of these is to more fully engage young people, by harnessing their natural interest in where and how they live and by using their own community as a source of learning and action.
Volunteering can positively affect individuals' development and well-being due to various motivational reasons. People's well-being increases because they enjoy helping others. The reward is internally due to an intrinsic motivation. People volunteer instrumentally in order to receive a by-product of volunteering. Their feeling of utility is increased by obtaining an extrinsic reward from it.
Intrinsic motivation - the motivation to engage in a volunteering arises from within the individual because it is intrinsically rewarding. Volunteer simply enjoys an activity or sees it as an opportunity to explore, learn, and actualize his potentials [2].

1. Pro-social attitude – to produce the good work and useful help might enjoy the outcomes of volunteering even more when the effort is provided by themselves. Involvement in community and organizational life through volunteering) support public engagement; create social norms – shared civic values, norms and social values.
2. Utility of the service - about the benefits of volunteering, more than 55% of volunteers stated that an important source of satisfaction is seeing the results of their work.
3. Supporting environment – volunteers are freely engaging in activities that they find interesting, that provide creativity, novelty and optimal challenge.
4. Helping others gives good feeling and enjoyment – volunteers receive a 'warm glow' from contributing time to the provision of a public good.

Extrinsic motivation occurs when we are motivated to perform a behavior or engage in voluntary service in order to earn a reward or avoid a personal falling. If the reason to do volunteering is based on external motivation, they see volunteering as an investment and expect external benefits or payoffs.

1. Investment in longlife learning and informal education - it is widely accepted that as knowledge and skills become obsolete, individuals continuously update their competencies in a process of continuous learning.
2. Investment in human capital – voluntary work can enhance individual employment prospects, if it is done long therm. It helps to improve social skill and competences and obtain new knowledge and experience by providing different type of activities, training and educational programmes.

3. Investment in the social network – Doing voluntary service volunteers can get in touch with authorities or make valuable contacts needed for getting well-paid job or achieving career.
4. Investment in society and active citizenship – voluntary work contribute to increase active involvement of youth in the society, formation of the civic society with prosocial values and interpersonal relations between different people in different regions.
5. investment in community based learning via volunteering - volunteers have more connections with others in their community; are more likely to attend community events; are more likely to take on a caring role for others and are more likely to believe that others can be trusted. When asked about their overall life satisfaction, they are more happy due to possibility to be part of community based learning to achieve to the best of their ability, and become

Examining the premise that volunteering is beneficial for the helper as well as the helped, a number of studies have looked at the impact of volunteering on subjective and objective well-being. Positive effects are found for life-satisfaction, self-esteem, self-rated health, and for educational and occupational achievement, functional ability, and mortality. Studies of youth also suggest that volunteering reduces the likelihood of engaging in problem behaviors such as school truancy and drug abuse [2].

Who volunteer during their studies develop more pro-social attitudes and are more likely to volunteer in the future. Volunteering takes many forms, each inspired by a different set of values and on the other hand, it can influence setting life priorities and human values by engaging youth in the active citizenship.

Individuals have unique experiences (trauma, relations with parents, helping others, social networks) that affect their value priorities. Values as desirable, trans-situational goals, varying in importance, that serve as guiding principles in people's lives. The crucial content aspect that distinguishes among values is the type of motivational goal they express. In the case, value priorities influence decision to be a volunteer and there is point in influence of volunteering on self-development and forming unique values in youth lives.

2. Research methods

The purpose of this research is to develop knowledge about pro-social attitudes of youth volunteers. It provides a framework for understanding how volunteers' values and reasons for volunteering influence volunteers' pro-social attitudes and make an impact on forming values of youth. Research was held in march-may 2013.

Our empirical analysis considers three indices of prosocial values of volunteering, aimed at measuring both the quantitative (number) and the qualitative (degree of familiarity and cooperation) character of human values, and intrinsic and extrinsic motivations to voluntary work and recognition of human values identified by young participants. Indicators: volunteering frequency, religion, university department and studies, human values according to Schwarz Value Survey, factors leading to volunteering (family and education of parents, positive example, social or university environment, a non-profit organization, self belief and self-value orientation);

As the tool of the research we use two questionnaires: 1. standardized questionnaire Schwartz Value Survey (SVS) - Basic Human Value Scale including 21 scales and 2. PVQ The Portrait Values Questionnaire.

The PVQ comprises 40 items. Each item consists of a description of a person ("portrait") with two sentences.

The subjects are asked to assess how similar to the portrayed person they are. Each portrait describes a person's goals, aspirations, or desires that point implicitly to the importance of one of the 10 basic values in the original theory. For example, "Thinking up new ideas and being creative is important to her. She likes to do things in her own original way" describes a person for whom self-direction values are important. For each portrait, respondents answer "How much like you is this person?" on a scale from 1 (not like me at all) to 6 (very much like me).

Table 1 Factorial structure of PVQ

	Openness to change	*Self-enhancement*	*Conserva-tism*	*Selftrans-cedence*
Self-direction	,758	-,118	,054	-,194
Stimulation	,694	,551	,528	,429
Hedonism	-,591	-,133	-,449	-,200
Achievement	**,958**	**,884**	,103	,183
Power	,199	**,951**	-,464	-,039
Security	,152	-,497	-,375	,778
Conformity	,212	,125	**,868**	,018
Tradition	,045	,338	**,780**	,362
Benevolence	,027	,111	,059	**,815**
Universalism	,467	,187	,094	**,912**

Power: Social status, dominance over people.
Achievement: Personal success according to social standards.
Hedonism: Pleasure or sensuous gratification.
Stimulation: Excitement, challenge, and novelty.
Self-direction: Independence of thought and activity.
Universalism: Understanding and concern for welfare of people and nature.
Benevolence: Enhancing the welfare of people to whom one is close.
Tradition: Respect and commitment to cultural customs and ideas.
Conformity: Restraint of actions that may harm others.
Security: Safety,stability of society, relationships, and self.

2.1 Sample

Responses were obtained in their native language from 1070 adult volunteers from 6 universities: UKF Nitra, SPU Nitra, Comenius university Bratislava, Slovak Technical university Bratislava, UMB Banská Bystrica, Art academy Banská Bystrica, Prešov university UNIPO, Catholic university Ružomberok, Trnava university in Trnava.

The sample is consisted of 51.4% of women compared with 48.6% for men at age of 19-25, total 1070 volunteers. An important indicator of research is religion. 35.2% of

respondents identified themselves as people with a firm faith. 25.9% said they practiced the faith and regularly attend church. 25.3% of respondents believe "in something", but do not go to any church. The remaining 13.6% of those without faith, nor do not practice it.

3. Results

The PortraitValues Questionnaire (PVQ) comprises 10 basic values that guide behavior. The Schwartz model postulates that these 10 values build a circumplex structure.

Table 2 Correlation between the values and sex

10 Value Scale	*Value*	*df*	*P*	*R*
Self-direction	11,208	5	0,057	-0,078
Achievement	17,26	5	0,082	0,119
Security	8,44	5	0,133	0,091
Stimulation	7,22	5	0,204	0,023
Tradition	12,98	5	0,024	0,065
Hedonism	14,06	5	0,015	-0,049
Benevolence	20,80	5	0,001	0,120
Conformity	45,48	5	0,000	0,096
Power	20,80	5	0,001	-0,097
Universalism	36,96	5	0,000	0,162

We indicated values such as power, achievement and stimulation as stronger preferred by men comparing to women. Men increasingly prefer the value of power than women, which results from the overall social status in professional and family life (37.5% to 23.3%).

The results show strong correlation between gender-woman and value scale – benevolence, self-direction and universalism.

We examined zero-order correlations between the two indicators ($p = 0.001$; $r = 0,189$) - sex and the value of helping others pointed to an important feature more common in female, such as warmth and related social helpful interactions leading to the strengthening of pro-social behavior.

The value of benevolence implies protecting and promoting the welfare of those whom the individual is often in the touch. High score at this value appeared in 26.9% of women compared with 17.8% for men.

The value of universalism as opposed to the value of benevolence applies generally to all people and nature, the person with a high score of this value is more likely to be tolerant, empathic, willing to help and get involved for the good of others. The correlation between sex and value universalism $p=0.015$, $r =0,074$.

47.6% of women absolutely think it is important that every person in the world are treated equally compared to men - 39.8%. For 29.2% of men it is important that all have equal opportunities in life, compared with 25.2% of women

Similarly, men and women want to be successful in life and hope that people appreciate what they do as volunteers. 14.4% of men considered it very important to be successful and 14.2% of women also consider success as very important (they want to achieve success while doing voluntary service). A similar view was held by men (19.2%) and women (18.7%) in claims that are deemed to be people who are not covet recognized for what they have achieved.

Young people have many opportunities in life that can be used to achieve career and especially women want to hold important positions as men. Many of young people consider volunteering as an investment in self-development to achieve new skills, as well as the opportunity to help others.

Table 3 Correlation between the values and religion

10 Value scale	*Value*	*Df*	*P*	*R*
Universalism	89,95	15	0,000	0,178
Achievement	37,84	15	0,001	-0,71
Security	36,96	15	0,001	0,013
Stimulation	67,65	15	0,000	-0,156
Self-direction	69,16	15	0,000	0,197
Tradition	84,51	15	0,000	0,241
Hedonism	47,94	15	0,000	-0,140
Benevolence	36,03	15	0,002	0,069
Conformity	39,46	15	0,001	0,104
Power	74,68	15	0,000	-0,252

The results show correlation between wealth and religion. The stronger the faith is, the less young man longs for tangible assets and money, because faith gives him the necessary spiritual values that stand above the wealth.

Respondents who reported a firm belief are the 31% who cannot covet, and only 9.3% of them are similar to the statement "I have a lot of money and expensive things." The value of money is very important, confirming 43.2% for respondents who do not believe in God. 24.5% of respondents with occasional faith have no significant relationship to wealth compared with respondents without faith, wealth is not important for them (17.4%). On the other hand, those who are craving power and money, represent the total sample 33.8% compared to those for whom this is not at all important - 37.4%.

The study discovered a relationship between the value of hedonism and faith ($p <0.001$; $r = 0,197$). The faithful young people appear low level of hedonism. Although the most of them are aware of the importance to have everything in life that one needs from a material point of view, faith in God gives them the belief that hedonism is not priority value in the first place

26.7% of strong believer and 15.5% respondent with faith indicated value the importance to listen to people who are different than them. Although, they dont agree with them, but want to help them.

The level of significance indicates a significant difference in the amount of universalism in various stages of faith $p <0.001$; that allows us to conclude that the believer has higher scores in social values is more likely to behave prosocial as unbelievers. The person with a high score of universalism and benevolence wants to help others. Volunteering is linked with value priorities such as utility, tolerance, empathic understanding and love of neighbour.

The value of **conformity** is determined by the power of belief in God. The results show statistically significant correlation between the various stages of respondents´ belief and the value of conformity ($p= 0.001$, $r=0.104$). We can make the argument that the stronger the belief in God is the greater tendency to behave in conformity volunteer

do. He believes that people should respect standards and rules even when no one sees them. Only 13.3% of the faithful young people said that the standards of society is not at all important to them. On the contrary, young people without faith (33.7%) consider that person is independent and do not have to respect other people.

Young people without faith or with a poor attitude to religion are individuals who prefer independent lifestyle without feeling guilty for their behavior because strict social rules are not considered as highly important for them.

Table 4 Correlation between the values and volunteering

10 Value Scale	*Value*	*df*	*P*	*R*
Self-direction	25,73	5	0,000	-0,009
Power	24,642	5	0,070	0,313
Univerzalism	24,62	5	0,000	-0,290
Achievement	13,05	5	0,023	-0,160
Security	10,88	5	0,060	-0,017
Stimulation	3,71	5	0,059	0,075
Conformity	23,36	5	0,000	-0,286
Benevolence	48,87	5	0,000	-0,409
Tradition	9,01	5	0,109	0,025
Hedonism	14,48	5	0,013	-0,130

Young people who are involved in volunteering indicate more social values than power, achievement and money. The value of achievement is important for young people. Volunteers indicate the value of achievement as important because they need to get acknowledgement, what they do.

39.2% of volunteers confirmed that success is very important to them, compared with 60.8% of students without volunteering experience. The opposite view is 37.4% of volunteers for whom success is not significant compared with 50.7% of students who are not engaged as volunteers.

The value of benevolence ($p<0.001$) presenting love, charity and care of others and nature was strongly indicated in people who become volunteers comparing to no volunteers.

68% of students-volunteers said that people should be interested in others, problems and taking care of nature, compared with 32% of students without volunteering experience. Only 35.2% of volunteers think that people should not care about the interests of others and things around them, compared with 64.8% of those who do volunteering.

Value of conformity ($p<0.001$) and universalism ($p <0.001$) in Analytical Testing data showed statistically significant differences in relation to the field of study. These values appeared in the higher score at students in social sciences (social work, theology, psychology, pedagogy) in compared with another science (technical, natural and agro sciences, economics, law and arts).

Women (67.3%) are increasingly involved in volunteering than men (32.7%), and it is more significantly important for female compared to male ($p<0.01$).

Table 5 Correlation self-development and volunteering

sex			*Self-development via*			*Total*
			Volunteering	*Longlife learning*	*Community based learn.*	
	Female	N	70	79	55	204
		%	34,3%	34,3%	27,0%	100,0%
	Male	N	79	42	20	141
		%	38,7%	29,2%	13,9%	100,0%
Total		N	149	121	75	345
		%	44,3%	34,2%	21,6%	100,0%

Young people identified importance of self-development for achieving competencies and social skills trough involvement in volunteering as a way to achieve personal development (44,3%); active participation in longlife learning (34,2%) and long-term community based learning (21,6%).

Table 6 Outcomes of learning via volunteering

Outcomes	*Value*	*df*	*P*	*R*
Need to learning	3,17	3	0,351	-0,071
Self-development	0,38	3	0,910	0,09
heightened sense of agency in your own education	7,59	3	0,044	0,102
greater understanding of how you are engaged in practices	3,12	3	0,034	0,83
Enhancement of skills	1,59	3	0,040	0,066
Interesting activity	13,50	3	0,030	0,182
Ability to communicate effectively and work with a diverse range of people	1,48	3	0,665	0,032
Heightened sense of civic responsibility	10,0	3	0,021	0,148
Increased sense of personal efficacy	10,68	3	0,034	0,159
Realistic self-appraisal and enhanced self-esteem	2,84	3	0,410	-0,056
Increased awareness of the world and appreciation for diversity	9,75	3	0,018	0,131

These outcomes of learning which proved significant in relation to involvement in volunteering, categorize personal motives/outcomes, including the following: personal efficacy ($p = 0.034$); an interesting activity ($p = 0.030$) and self-development ($p = 0.910$).

Data analysis show significant differences in outcomes of learning due to volunteering and to the normative motives. This means that with increasing citizens' initiative ($p <0.018$; $r = 0.131$) women increases the assumption that they will be more likely to engage in volunteering than men for whom the normative motive represented in a slightly lesser extent.

Table 7 Reasons for community based learning

Benefity and impacts	*N*	*Min*	*Max*	*Mean*	*Modus*
empowerment of community	548	1	4	2,03	1
active nembers of community	548	1	4	2,72	4
I find myself and beter understanding	548	1	4	2,13	1
meet community relationship	548	1	4	2,29	2
new social contact and friendships	548	1	4	2,25	1
a lof of beneficts for self-development, more skilled	548	1	4	2,36	2
higher self esteem and self-confidence	548	1	4	2,45	2
support of life-long learning	548	1	4	2,13	1

There is significant correlation between impacts of volunteering and the changing and/or forming value priorities and awareness of importance of longlife and community based learning. The most of volunteers agreed that their value priorities have been changed while participating in long-term voluntary programme, especially they are more likely to be keen on responsibility for own leaning. Volunteering helps them to make clear in the advantage of community based learning, they became more empathic to community needs also find sense of life in doing voluntary service for others. It gives them opportunity to obtain new skills and get new social contacts and also support longlife learning.

Volunteering is not a primitive stage of social work, which must be overcome, but it is the social conscience of civil society and other forms of social work. Many social workers could improve their work if supported each other and to train volunteers. Danger, however, is the abuse of volunteer work as a substitute for professional work [1].

4. Conclusion

We find that the creation of social capital through participation in voluntary associations is not indifferent to the motivations which induced the volunteer to start his/her unpaid activity. In particular, we show that intrinsic motivations enable people to extend their social networks by creating relations characterized by a significant degree of familiarity. By contrast, extrinsic motivations, and in particular the decision to join an association in order to increase the number of acquaintances or friends, promote the creation of networks from a quantitative point of view, but they do not facilitate the creation of relations based on a particular degree of confidence.

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USING WEBQUESTS TO TEACH CULTURE-RELATED ENGLISH VOCABULARY - HOLIDAYS AND FOLK TRADITIONS

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Abstract: *The aim of this paper is to investigate the use of WebQuests in teaching and learning vocabulary connected with English culture. Empirical research, consisting in the observations of students and pre- and post-study tests administered among third-form junior-high school learners in Poland, was performed to assess the development of their command of English and their memorization of facts related to British holidays and traditions. The idea of integrating WebQuests into English lessons to achieve students' success in learning is thoroughly explained in the article. The main argument is that this procedure boosts students' creativity. The article also includes a sample WebQuest created during the research project.*

Keywords: *WebQuest in education, web-based teaching, teaching culture-related English vocabulary*

1. Introduction

There are many trends in recent methodological theory regarding the teaching of English. Nowadays, the impact of computer science on English teaching is becoming more and more significant, hence some of the latest methods encourage teachers to use digital tools (Noblitt, 1991; Sandholtz, Ringstaff, and Dwyer, 1997; Brown, 1998; Logan and Scheffler, 1999, Schrock, 2002; Raia, 2009). A WebQuest is an example of such a solution.

The present study is based on empirical research into English vocabulary teaching. Two groups of Polish learners were instructed with the use of different pedagogical approaches – one in a traditional manner, and the other with the help of a WebQuest. The results of the students' pre- and post-tests as well as observations of their lexical efficiency improvement indicate that WebQuests enhance their English vocabulary acquisition and facilitate knowledge storage. The choice of the tool was motivated by the desire to offer an easily accessible solution for language teachers and by the aim of the study, i.e. the teaching of culture-related vocabulary. The study demonstrates that teaching English vocabulary connected with the target language culture naturally benefits from the use of the Internet in the process, as it engages students more than traditional books and provides them with an incentive to actively pursue their interests.

2. Theoretical background

A WebQuest is an enquiry-oriented activity. The technique was devised in 1995 by Bernie Dodge and Tom March at San Diego University. It provides directed learning using a number of sites as sources of information.

WebQuests can be divided into short-term (1÷3 classes) and long-term (1÷4 weeks) ones. The instructional goal of a short-term WebQuest is knowledge acquisition and integration – the learner deals with a significant amount of new information. The objective of a long-term WebQuest is to extend and refine already established knowledge – the learner deeply analyzes a body of data, transforms it, and demonstrates understanding. Short-term WebQuests can be more common due to their simplified procedure. Long-term WebQuests require special skills, such as (Schrock, 2002: 5): the ability to classify, induce, deduce, analyze errors, construct support, abstract, and estimate perspectives.

There are critical attributes which are parts of the WebQuest model, such as (Schrock, 2002: 6; Raia, 2009: 2): introduction, task, process, information sources / resources, evaluation, and conclusion. There are also important non-critical attributes, including group activities, role-plays, and single discipline or interdisciplinary elements.

The WebQuest method provides opportunities for the use of information technologies, which is a way of realizing constructivist ideas of education in full-time education as well as distance learning, involving the use of the Internet and its resources.

3. Methodology

The following section illustrates the project developed by the present author for introducing English culture to students with the help of a WebQuest; the topic was thematically organized around British holidays. The project was interdisciplinary and involved teamwork; its essence was the use of computers during English lessons for the purpose of doing various exercises. The main method was the WebQuest, and the students also had the chance to practise its use at home as they completed their homework. In fact, one of the goals of the project was to prepare the students for using information technology and WebQuests outside the classroom, providing an incentive to learn both at school and at home. As part of the project, the students presented their own work, which was based on the comparison of British customs with the ones they knew from their own country. The project aimed to prepare students for the application of information technology in their own work, and so the teachers' task had to be focused on assisting them in reaching the sources of information and in interpretation of the collected data. The students felt that they actively participated in the process of education –

they were the driving force behind their own learning. The project gave the students an opportunity not only to use the Internet, but also to seek and process information through the use of the WebQuest method, and thus to practise problem-solving, critical and creative thinking, and teamwork. The method did not only include processing information but also involved writing summaries and other forms of composition on the basis of the collected data, as well as the presentation of the findings. Consequently, WebQuest helped to develop in the learners the ability to think critically, boosted their presentation skills, and fostered their general ability to approach various issues from different perspectives.

3.1. The goal of the project

The goal of the project was to demonstrate and evaluate the use of WebQuests in teaching about British holidays. It is claimed that WebQuests enrich students' vocabulary – this was investigated in the presented study by observing whether students developed a greater store of English vocabulary on a given topic when instructed by means of the WebQuest method.

3.2. Participants

There were 100 participants involved in the study: 58 females and 42 males aged 15 from four third-form junior-high school classes, all on the same pre-intermediate level of English. The 'a' and the 'b' classes were joined into one group instructed by means of traditional methods, which I will refer to as the 'paper' group, while the other 'c' and 'd' classes formed the 'WebQuest' group. Each group consisted of 50 members: 30 females and 20 males in the paper group, and 28 females and 22 males in the WebQuest group.

3.3. Design and procedure

The present study focuses on the impact of using WebQuests by learners in acquiring English vocabulary connected with culture, especially with holidays.

The two groups of students were taught vocabulary connected with traditions and holidays with the use of different tools. The 'paper' group was taught without the use of computers, thus the learners' participation in the process of learning was passive. The instruction of the other group included the use of computers and the WebQuest method; this proved to be much more successful in provoking the students to active engagement in classroom activities, sparked their interest in the topic and inspired them to learn and to attempt on their own to complete problem-solving tasks connected with national traditions on their own. The students worked individually and cooperated within groups. For the first group, the topic of holidays and the learning of vocabulary proved to be difficult and boring. For the other group it was much easier and more interesting, and the method is promising as regards the perspectives of using it during English lessons to teach other topics, which certainly warrants further study.

All students wrote a pre-test, confirming they did not have any prior knowledge of English vocabulary / facts related to the topic. Next, the paper and WebQuest groups were taught relevant elements using different tools – traditional exercises from different books, and WebQuests, respectively. After the lapse of three months of learning both groups were asked to write a post-test, unaware that it would be identical to the pre-test.

3.4. Test results before the research project

As far as matching holiday words with their definitions is concerned (exercise 1), 72% of the members of the WebQuest group scored 4 points. The highest score was 5, achieved by 14% of the students. The paper group had similar results – 74% of this group scored 4on the first exercise. The highest score was also 5 points (12% of the students).

In choosing the correct word (exercise 2), 72% of the members of the WebQuest group got 3 points in the pre-test. The highest score was 4 points (12% of the students). The paper group had similar results – 70% of the group scored 3 points for the second exercise. The highest score was also 4 points (8% of the students).

In the activity based on circling and correcting mistakes (exercise 3), 92% of the members of the WebQuest group got 3 points before receiving instruction. The highest score was 5 points, achieved by 6% of the students. The paper group had similar results – 94% of this group got 3 points for the fourth exercise. The highest score was also 6 points (2% of the learners).

In the activity based on translation of English words into Polish (exercise 4) 86% of the members of the WebQuest group scored 5 points. The highest score was 6, achieved by 6% of the students. The paper group had similar results – 84% of this group scored 5 for the first exercise. The highest score was also 6 points (8% of the students).

In the activity based on translation of Polish words into English (exercise 5) 54% of the members of the WebQuest group scored 5 points. The highest score was 6, achieved by 6% of the students. The paper group had similar results – 52% of this group scored 5on the first exercise. The highest score was also 6 points (8% of the students).

The results of the pre-test among the WebQuest group and the paper group were similar. The WebQuest group scored 775 points in total, i.e. 31%, while the paper group scored 800 points, i.e. 32%. Both groups displayed a similar level of familiarity with the presented vocabulary. The findings are shown in Figure 1 and Figure 2 below.

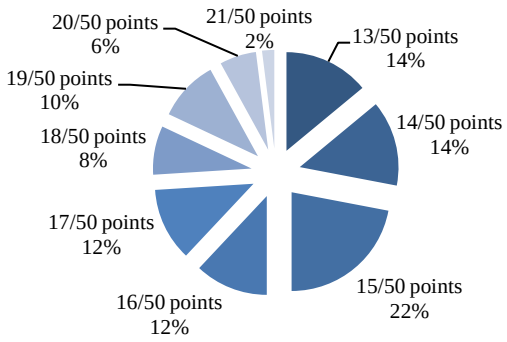

Figure 1. The results of the pre-test in the paper group

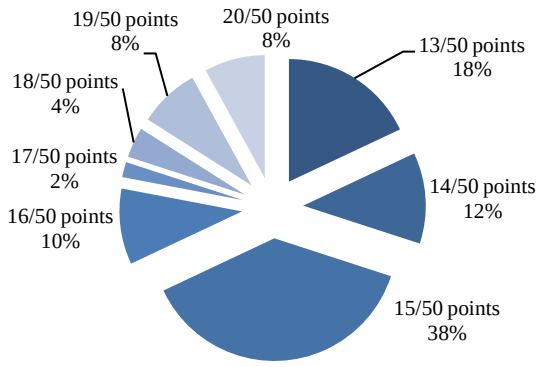

Figure 2. The results of the pre-test in the WebQuest group

3.5. The sample WebQuest created by the author

Elements of a foreign culture can be a very engaging topic for students in their English lessons. April Fools' Day was selected on the basis of the student's suggestions, and an appropriate WebQuest was created for this purpose. The author provided the students with information about the origins of April Fools' Day, dating back to 1582 when confusion was created upon replacing the Julian Calendar with the Gregorian one.

The students were to conduct their research on observing April Fools' Day in various countries. This web-search project was performed as an extension of course book material. To make this activity unique, the participants had to prepare a special writing feature which involved the creation of imaginary interviews with people from different countries. In their interviews, the students had to include facts concerning their observations of this day in different countries, the exact date, and the time of day when the observances are usually held.

In the process each team-member was assigned the task of researching, recording, and reporting this information. The students had to consult two webpages suggested to them:

- http://wilstar.com/holidays/aprilfool.htm;
- http://www.april-fools.us/history-april-fools.htm.

While browsing through materials connected with April Fools' Day, they had to notice where, when and how it is observed.

The next step was to create a list of countries that observe the April Fools' Day traditions, including short descriptions and links to other websites for each country. At this stage, the students had to make a decision about three countries they wished to cover. They were to start writing by explaining the "who, why, where, and how". While answering these questions, they were asked to add information about the celebrations in each selected country.

Furthermore, the teacher provided the students with the examples of other supplementary webpages, for instance:

- http://teacherlink.ed.usu.edu/tlresources/units/byrnes-celebrations/april.html
- http://www.museumofhoaxes.com/hoax/aprilfool/
- http://aprilfoolzone.com/

The outcome of the project was to have the students notice the diversity of April Fools' Day related traditions around the world. The students' understanding of the impact this day may have on people misled by the information fabricated and published on the day of the festival broadened due to their exposure to extended information about it. They could also use the materials from the WebQuest as a reference point for future study of other nations' cultures and their traditions.

3.6. Test results after the research project

After completing the classes, both groups were administered a two-page post-test (identical with the pre-test), whose results form the basis of this analysis. The five constituent tasks involved: matching holiday terms with their definitions (I), choosing the correct word (II), correcting mistakes (IV), translating English words (V), and translating Polish words (VI).

In the final test concerning the vocabulary and data connected with British holidays the paper group scored only 75% as compared to 96% in the WebQuest group.

As far as matching holidays words with their definitions is concerned (exercise 1), 86% of the members of the WebQuest group got 10 points. The lowest score was 8 points (6% of the students in this group). The paper group displayed worse results – 28% of the group scored 10 points for the first exercise. The lowest score was 5 points (14% of the group).

In the activity which involved choosing the correct word (exercise 2), 82% of the members of the WebQuest group got 10 points. The lowest score was 8 points (8% of the learners). The paper group's results were considerably worse – 30% of the group scored 10 points for the second exercise. The lowest score was 5 points (26% of the group's members).

As far as correcting the mistakes is concerned (exercise 3), 80% of the members of the WebQuest group got 10 points. The lowest score was 7 points (10% of the group's members). The paper group came up with had worse results – 24% of the group scored 10 points on the fourth exercise. The lowest score was 4 points (20% of the group).

As far as translating English words into Polish is concerned (exercise 4), 90% of the members of the WebQuest group got 10 points. The lowest score was 8 points (8% of the group's members).The paper group had worse results – 32% of the group scored 10 points for the fourth exercise. The lowest score was 4 points (18% of the group).

As far as translating Polish words into English is concerned (exercise 5), 82% of the members of the WebQuest group got 10 points. The lowest score was 7 points (6% of the group's members).The paper group had worse results – 28% of the group scored 10 points for the fourth exercise. The lowest score was 3 points (12% of the group).

The results of the post-test among the WebQuest group and the paper group differ, as compared to the pre-test – the former group scored a total of 2400 points (96%), while the latter only 1900 points (75%). The data shown in

Figure 3 and Figure 4 present a 21% difference between the groups that was according to Mann-Whitney's test statistically significant (p-value <0,0001).

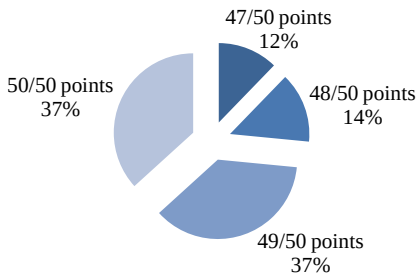

Figure 3. The results of the post-test in the WebQuest group

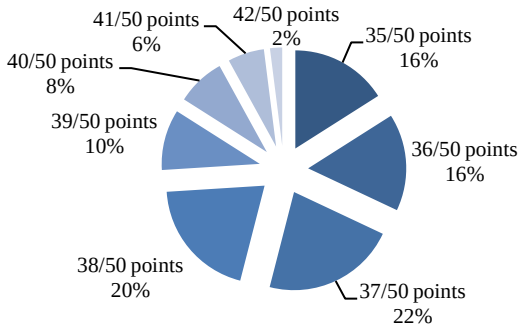

Figure 4. The results of the post-test in the paper group

4. Conclusion

Internet tools constitute valuable resources and support in teaching. Teachers should be aware of the variety of WebQuests, as they represent a reasonable Internet solution for FLT. They enhance students' creativity, allow them to acquire knowledge with enthusiasm, and boost their confidence. WebQuests are often completed in small groups to have greater chance to interact with one another, which facilitates peer evaluation and correction. Additionally, WebQuests often include questions that encourage mental effort and discussion, hence they support critical thinking, knowledge application, social skills, and scaffolded learning. WebQuests are great motivators for students, who are likely to enjoy innovative project-based activities.

The results of the present project indicate that WebQuests enhance students' language learning and acquisition. Students that used WebQuests during English lessons achieved better results, displaying enhanced vocabulary and data retention. The project was a pedagogical success.

The findings allow for putting forward the hypothesis that other Internet tools (e.g. blogs) can also enhance students' language acquisition. Therefore, further research should be carried out in order to evaluate additional solutions.

Definitely, WebQuest is not suitable for the implementation of each and every topic. However, using WebQuest in teaching vocabulary connected with culture and holidays proved to be successful and effective. This is confirmed by the results of the research, which clearly indicate that the group where the implemented method was the WebQuest – an approach that is far more engaging and interesting – the level of the retention of the presented material was much higher. Learners from this group were also much more apt at using the knowledge they acquired in the course of their lessons and at applying the skills gained with the help of the WebQuest. Moreover, they were more creative and completed problem-solving tasks faster than students instructed using traditional methods. They also improved their group work skills in the process. The use of the WebQuest method effectively engaged the students in the didactic process, as it was them who directed their own learning, and selected and processed information, thus actively participating in the lesson. Furthermore, they had a chance to use computers, engaging in an activity that they knew and enjoyed. The use of photographs, videos and audio files constituted an additional positive factor that boosted students' level of retention of the presented material.

All in all, it may be concluded, that WebQuests are of particular use in teaching cultural-related vocabulary. According to the experiment outlined above, this form of learning seems to be more effective than the traditional methods. The reason is the fact that WebQuestsare designed to develop students' thinking skills and improve their problem-solving abilities. The application and advantages of the WebQuest method are important, because WebQuests offer an opportunity for groupwork, but can also be used for self-study and individual, distance learning, within the system of non-formal education and in lifelong learning.

WebQuests develop skills such as communication, teamwork, problem solving, as well as critical and creative thinking, which have proved to be more important in today's world than having students use memorized material. They allow students to explore controversial issues and find their own answers to interesting questions. A well-designed WebQuest allows the students to work independently and enables teacher-assisted learning, thus helping to develop their imagination and creativity. Activities than can be successfully implemented by teachers in the process of their students' learning of English include, among others, building online databases on different areas of knowledge by the students, moving in virtual space, creating interactive stories, preparing documents describing various situations, or imitating personalities from the world of politics, art and business during simulated online conferences.

The results of the research strongly suggest that WebQuests have an advantage over traditional methods. They are designed to motivate students to use information in a creative way and not just to search for a particular information item. They also encourage them to seek support for their opinions on higher taxonomic levels of analysis, synthesis, and evaluation. Using WebQuests leads to discovering new information. They can be used both as the main and as a supporting method for expanding students' knowledge. They allow students to work at their own pace and develop creative thinking needed in learners' lives. Above all, WebQuests motivate students to

learning and they are more effective than traditional approaches.

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SEX DIFFERENCES IN THE ASSESSMENT OF SOCIAL FUNCTIONING

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Abstract: *Research in the field of social cognition is focused not only on ability to understanding others minds but also on assess the ability to do it. The key question of this study was whether male and female differ in their assessment of social functioning. 75 people aged 18 to 60 years were studied. Into the studies Cambridge Behavior Scale, Liebowitz Social Anxiety Scale Test and B. Wojciszke Q-sort method for estimate social self-esteem and social-acceptance were used. The results confirmed established hypothesis partially. Women and men did not differ in the assessment of self-esteem but in self-acceptance. Female have higher social anxiety then male. However, they have the same level of avoidance social situations. Furthermore, women characterized by higher empathy level than men. Results indicate that there are gender differences in estimate social functioning, that may results from stereotype and social expectations.*

Keywords: *social functioning, social anxiety, self-esteem, gender*

1. Introduction

Social cognition is a broad construct that lies between cognitive and social psychology. It explores the way people think about themselves, about the social world, especially methods of selection, interpretation,
storage and use of information for formulating social courts
and decision-making [1]. Currently, the most commonly studied area of social cognition is the theory of mind (ToM) - the way people try to understand others minds [2]. Whereas, for the purpose of this article we examined how people think about themselves as social beings and how it is depended on their gender.

1.1 Sex differences in social functioning

Many studies show that women and men behave differently in social situations. For example, women shows greater empathy [3] and less autistic traits [4]. Studies have shown that the male infants demonstrated a stronger interest in the items like mobile phone while the female infants demonstrated a stronger interest in the face [5]. Then, in 3- to 5-years old children, theory of mind understanding significantly predicted aggressive or disruptive behavior for boys and prosocial behavior for girls [6]. A meta-analytic review revealed that men exert more influence than women [7]. Even analyses on 50-95 years old women reveal that women have larger networks and receive supports from multiple sources, while men tend to rely on their spouses exclusively [8].

1.2 Self-knowledge and social self-esteem

Self-knowledge is essential for social functioning. It is deliberated, organized and constant getting to know yourself, learning about your characteristics, opportunities and weaknesses [9]. On the basis of social self-knowledge people create social self-esteem, which is affective reaction of a man on himself [10]. Most of people have a positive attitude toward themselves [11]. However, a stereotype suggests that women have better social skills then men. Therefore, social expectations of the social functioning are higher for women.

1.3 The Present Study

The key question of this study was whether male and female differ in in their assessment of their social functioning. First of all, it was examined whether sex differentiates social self-esteem and self-acceptance. Since women cope statistically better in social situations, they should estimate higher their own social abilities. On the other hand social expectations for female social skills may be too high so a woman lowers estimation of her own social abilities. While men have more autistic traits, they may not notice their poor social skills.
Secondly, it was examined if gender differentiates social anxiety. Study show that autistic people have higher social anxiety and even social phobia [12]. It was assumed that men, who have higher autistic traits, estimate higher their own social anxiety than women. If women are better in social functioning, they should estimate lower social anxiety.
The third hypothesis assumes that women have higher empathy than men. Many studies show that empathy depends on gender. Women are statistically more sensitive than men for social clues like eyes and faces, as well as for emotions [3]. They should estimate higher their empathy level.

2. Method

2.1 Participants

Subjects of the study were recruited by interviewers in Gdańsk. The study involved 75 participants, aged 18-60 years old (M age = 28; SD = 10). However, most participants were young adults. 56% of participants were men. 52% of subjects were students, 2 persons had primary education degree, 2 persons had professional education degree, 14 people had secondary education degree and 18 people had higher education degree. 32 people studied science, 31 humanities and 12 people studied natural science.

All respondents received an explanation of the purpose of the test and its procedure. The test was proceeded after a consent of participant.

2.2 Measures

The study used three questionnaires. First was B. Wojciszke Q-sort method (QFS) estimated self-knowledge about social functioning [13]. The purpose of the test was to attribute positive and negative terms about social skills into 11 categories, marked with letters from A to F. Where the "A" determined the least matching scheme and the "K" determined best match. In the category "A" and "K" can be placed only two expressions, and in the intermediate category "F" there was ten expressions. Finished test took a form of pyramid of cards. It represented the structure of self-esteem. Subsequently, the participant had to repeat the task by fitting expressions into the pattern of ideal him/her. As a result, using the model created by the authors of this method, a rate of self-acceptance was received.

Second method was Liebowitz Social Anxiety Scale (LSAS) [14]. The reliability coefficient was measured and internal compliance was α=0,96. Polish version of this method have reliability between 0,92-0,96 (α Cronbacha). The scale consists of six sub-scales - the fear of performing tasks in social situations, to avoid such situations, fear of social interaction, avoidance of such interaction, general anxiety and general avoiding.

Third method was The Empathy Quotient (EQ) - a scale developed by Baron-Cohen and Sally Wheelwright in 2004 [15]. The selected version of this scale consists of 60 items, which participants can respond in 4 possible ways – I definitely not agree, tend to disagree, tend to agree and strongly agree. Out of this amount, 40 sentences relate to empathy (cognitive and affective), and the remaining 20 serves to distract the participant from the true purpose of the study.

2.3 Procedure

First subjects performed the Q-SORT method for real I and then for ideal I. Next, they complete an anxiety and empathy questionnaires. Finally, to avoid the stereotype threat, participants completed their profile with basic information – age, gender, education, specialization.

3. Results

Basic statistics can be found in Table 1.

Table 1. Descriptive statistics

		M	*min*	*max*	*SD*
QFS	self-esteem	41.80	8	57	10.19
	self-acceptance	0.7	-0.09	1	0.27
LSAS	anxiety	23.96	1	58	12.25
	avoidance	24.03	2	58	12.64
	overall result	44.79	4	116	24.02
EQ		38.41	6	60	10.56

3.1. Self-esteem and self-acceptance

For analysis used U Mann-Whitney test. Results showed that women and men statistically significant differ in social self-acceptance ($p < 0.05$) but not in social self-esteem ($p = 0.86$). Women estimate their self-acceptance lower ($M = 0.65$; $SD = 0.25$) then men ($M = 0.75$; $SD = 0.27$).

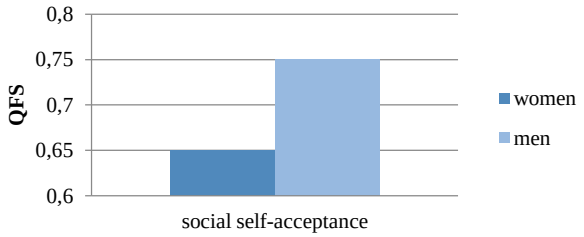

Figure 1. Social self-acceptance in women and men.

3.2. Social anxiety and avoidance

For analysis it was also used U Mann-Whitney test. There was difference between men and women in social anxiety ($p < 0.05$) but not in social avoidance ($p = 0.27$) and overall result ($p = 0.13$). Women had higher anxiety ($M = 26.48$, $SD = 12.44$) then men ($M = 21.98$; $SD = 11.88$). Moreover, women had significant higher anxiety especially in social activities than men (women: $M = 14.67$; $SD = 6.22$; men: $M = 12.05$; $SD = 5.88$; $p < 0.05$).

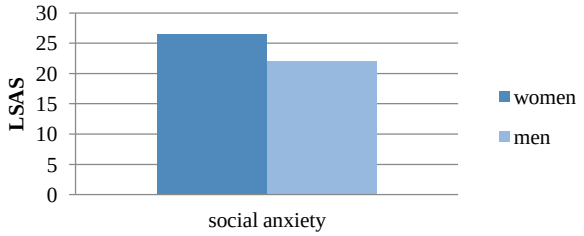

Figure 2. Social anxiety in women and men.

3.3. Empathy

For analysis the level of empathy in women and men also used U Mann-Whitney test. There was statistically significant difference between men and women in empathy level ($p < 0.001$). Women assessed their level of empathy higher ($M = 43.36$, $SD = 7.66$) then men ($M = 34.52$; $SD = 10.97$).

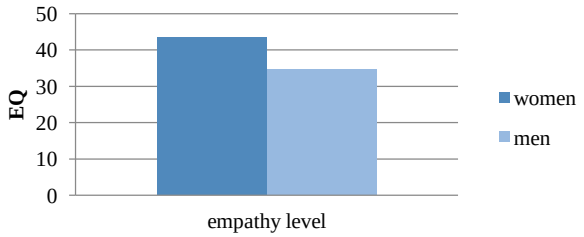

Figure 3. Empathy level in women and men.

4. Conclusions

This study aimed to establish whether gender differentiates assessment of social functioning. The results was very interesting and partially compliant with hypotheses. Women and men did not differ in social self-esteem. It is compatible with two major reviews [16,17]. Although

male and female did not differ in social self-esteem, female more often have lower self-acceptance in social situations. It may be result of stereotype and higher social expatiations toward women [18]. It is possible that men, who have more autistic traits then women, do not see as many aspects of social interactions as women, so they do not see their failures.

Furthermore, female showed higher social anxiety then male. It is inconsistent with earlier studies [19]. Since women are better at understands other minds, they can be more afraid then men of judging by others. Studies showed that socially anxious women made significantly more negative and fewer positive self-statements in a dyadic encounter than women low in social anxiety [20]. It can be vicious circle – social anxiety may lead to lower social-acceptance, and lower social-acceptance may lead to social anxiety.

Clearest gender differences are related to the empathy level. According to earlier studies women are better than men in empathize. There are more sensitive to social clues, such as eyes, facial expressions, voice prosody, body posture or gesticulation [21]. Many researches suggests that females empathy is evolutionary adaptation for their social role [22].

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FAIRY TALE IN THE BIBLE

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Abstract: Nowadays – in 21st century, can we take the Bible seriously? Isn´t it perhaps full of contradiction, nonsense and historical inaccuracies? Haven´t the archaeological discoveries contradicted its authenticity? A rationally thinking man believes that reliability of each historical document must be verified. What the Bible is offering us "the history of salvation". Thus, the content from which we should learn a lesson a urselves inpired so that we can come happily to the finish line… Objective of this paper is to point at the fact why are some biblical texts understood in certain cases ar fairy tales.

Keywords: *Pavol Dobšinský, fairy-tale, three coppers, life, work*

1. Introduction

The Bible has no ambition to become a fairy tale book at all. What it is offering us is "the history of salvation", thus the content from which we should learn a lesson and let ourselves inspired so that we can come happily to the finish line... . The Bible is valuable by offering the correct value orientation for life, being a modern GPS[1], because it shows the correct direction in life, outlines some borders – what to cling to and what to avoid, so that the man does not get lost on their way of life. Therefore, it is frequently confronted as being a fairy tale, containing wisdom and will of fight of the good against the evil. In the past more often, nowadays less frequently, but still there are people who would say: *""Who would believe in the Bible? It is only a collection of old legends and fairy tales."* Every nation has it in its cultural heritage and since Israel is an old nation, they are really old.

Nowadays, in the times of liberty and freedom in literature publishing, many different versions of the Bible appear on the book market. Adapted biblical texts for children belong nowadays to respected genres of children literature. However, to adapt the texts to child´s perception means intervention in the literature type in the Bible. Then, there is a sensation that the biblical texts are fairy tale-like. Original authors wrote individual biblical books in three languages: Hebrew, Aramaic or Greek. Hebrew has been used until today, it is the language of today´s Israel, Aramaic is used in Syrian area and Greek language is used in current Greece and also out of it. Nearly all books of Old Testament are written in Hebrew. Unlike the western languages, its writing is read and written from the right to the left and there are no vowels used. (Lightfood, 1984, p. 13).

Particular biblical books originated in long time horizon, in different parts of the world, in different political situations and were written by authors of different nationalities and education. Therefore, the Bible is a collection of books which frequently vary by their different style. Actually, within one and the same book there are frequently different literary types. The issue of literature type is significant for correct understanding of a biblical text. Simple narration of a story, for example in the Old Testament book Ruth, is perceived by the reader in a different way than a poetic book the Song of Songs, reading which it is definite that the used metaphors and hyperbolas are not deemed word for word. Bible reader should look at individual books with knowledge that the biblical texts must be read and interpreted according to particular literary type and its concrete version is in question. (Petrů, 2000, p. 71). We can find all three literary types in the Bible, thus the ways how it is possible to divide the literary works.

2. Epic poetry in the Bible

Epic poetry is the most represented in the Bible and it is characterized more or less by developed narrative procedure, frequently replenished with a description (it is predominated for instance in the book Leviticus) and a reflection (predominant in the books Preacher and Proverbs). Narration is set in certain time and space and written mainly by prose. Typical representative of simple narration is the book Genesis. There we can find a number of significantly epic stories with minimum lyrical turnings, for example Creation of the world (Gn 1,1 – 2,4a), construction of Noah´s arch (Gn 6), life stories of great Old Testament characters: Abraham, Moses, Isaac, Jacob and Joseph. Other documents where the story goes first are the books: Ruth, 1st and 2nd Samuel book, the Book of Esther and also Jonah as the only from Prophet Books.

2.1 Lyrics in the Bible

Lyrical genres are characterized, in the Bible as well as generally, by timeless narration constructed from the subjective point of view. Verse is typical for lyrics, but it is not a condition and the texts with complicated internal bonds contain large amount of metaphors and symbols. The field of lyrics includes a significant part of Old Testament: Book of Psalms, Proverbs, Preacher, the Song

[1] GPS – Global Positioning System is a satellite navigation system used to obtain accurate position and providing very accurate time reference nearly anywhere on Earth or on Earth´s orbit.

of Songs and prophet Jeremiah. Poetic passages can also be found in the Books of Moses and prophet´s scripts, and on the contrary, in purely poetic books we can occasionally find epic extracts. The mentioned books of poems were written in Hebrew, and therefore we can find there the poetry different from classic European way of poetry writing. Hebrew poets did not create any rhymes, but different rhythmical verses of different length. (Lightfood, 1984, p. 144). A key element for Hebrew poetry is the so-called parallelism that occurs in two modifications. Synonymous parallelism is more simple in the form where there are some ideas repeated in the second line of a typical poetic two-verse included already in the first line but with the help of other words *"Who may ascend the mountain of the Lord // who may stand in his holy place?* (Psalm 20,3). Against that, in the form of antithetic parallelism the same idea is said in the way that the first part of the two-verse expresses the main idea positively and the other part transfers it to negation *„The name of the righteous is used in blessings // but the name of the wicked will rot.* (Proverb 10,7). A significant element of biblical poetry is poem in the form of akrostich, or an alphabet song. It is a longer poem, in which each verse or stanza is starting gradually with particular letters of Hebrew alphabet, starting with the first and ending with the last one. However, this characteristic is lost in translation. An example of akrostich in the Bible in Psalm 119 (at the same time, it is the longest psalm of all biblical psalms) and in the shortened version this form is in the 31st chapter of the Book of Psalms and in the third chapter of the book of Jeremiah. (Šándorová, 2013, p. 15 – 19). In such verses, names of particular phonemes of Hebrew alphabet are set in the brackets at the beginning of the stanza: *Aleph, Beth, Gimel, Daleth, He, Wav, Zayin, Heth, Teth, Yodh, Kaph, Lamedh, Mem, Nun, Samekh, Ayin, Pe, Tsadhe, Qoph, Resh, Shin, Taw"* (Psalm 119).

2.2 Drama in the Bible

A typical drama book in the Bible is the book of Job. The Old Testament document includes all basic elements of drama: sujet line divided into particular narrations and scenes, text with dialogues, plot embodied in fictitious time and space and also the language corresponding with nature of the character. This spiritual drama in verse (with prosaic prologue and epilogue) is divided, apart from typical biblical division into verses and chapters, into initial picture, leading the reader in the issue of the whole book. What follows is the main, most extensive part, in which Job and his friends were discussing the situation which he had found himself in despite his saintliness. Before each dialogue, it is stated who is speaking - always according to the same scheme, only the name of narrator is changed *„Then Eliphaz the Temanite replied: ...* (Job 4,1). The book finishes by Job´s prayer for his friends and final paragraph *Job´s new welfare.*

3 Interpretation of the Bible as a fairy tale

Biblical issues have been penetrating in different areas of human life, such as painting, sculpture, literature, theatre, as well as children´s literature and film. Importance of knowing the Bible has been generally grasped by Vladislav Stanovský in his article published in the magazine Zlatý Máj in 1990. *We are living in the period when everybody suddenly meets the Christianity and does not know what to do with it. Television broadcasts some Christian worship, but who knows what the mass is and what it means. The children, of course, cannot know it and mostly neither their parents, nevertheless they are professed Christian church. Thus, I think what is important, and it should be the first task, is to give children some reading, explaining them what Christianity is.*(Stanovský, 1990, p. 477).

Reading of the Bible itself is not easy even for an adult (especially without religious education), not for a child. The main reason is plenty of biblical books, different in terms of genre, but also different attitude of reader to the Bible. It is perceived otherwise by a theologian who can see God´s word in it, a reader for whom the Bible is only one of many well-preserved historical documents and otherwise by a child. Therefore, lots of biblical adaptations have been created during history of literature, whose main idea was to inform the child reader, in a responsible form, about the Bible, its stories and its message, and on the basis of biblical stories´ narration to differentiate between the good and the evil, and thus to contribute to creating their value orientation. The best way of getting acquainted with biblical texts was to transfer them into children´s fairy-tale language. Adaptation of the Bible for child reader may be summed up in the following items:

- Authors of adaptations extensively limit, redo and drop the texts which are too complicated as for their ideas, which contain extensive descriptions, directions and rituals, or the stories not suitable for child readers due to violence and erotic motives (in adaptations for children there is no reference to Israelite wars with surrounding nations or to polygamy of King Solomon);
- Major parts of biblical adaptations contain significant narrative stories, based on narration, which are interesting for children thanks to a fetching story, often with fairy-tale features and thanks to extraordinary characters (Noah´s Arch, David and Goliath, Queen Esther);
- Adaptations intended for readers emphasise presentation and clarification of basic Christian values, such as love, belief, responsibility for own life and lives of other people, liberty, patience or goodness;
- An important feature of biblical adaptation intended for children is adaptation of language and stylistic aspect. Authors simplify and make the original terms, word order and total structure of the text more clear, replace the incomprehensible words, drop descriptions of passages and plot turnings, replenish the text with historical or geographic information and help the reader understand the character, their nature and acts;
- Biblical adaptations, regardless of their period of origin or author´s association keep, in most cases,

progression of individual stories according to their structure in the Bible. However, there are also some cases when the author changes order of particular events, thus not complying with biblical chronology. Change of order of particular stories occurs when the author wishes to highlight certain event and enable the child to understand it better;

- Typical for adaptations intended for children and youth is an effort to keep child´s attention and make contact with them. Child readers are placed also in the role of listeners, addressed at the beginning of the story, and the following story is as if being narrated to them. The method appears in adaptations indented mainly for thesmallest children, where the child may be addressed by the author and their attention may be drawn to different interesting facts or connections in the story, also in the course of the story.
- Adaptations intended for children and the youth appear mainly in the form of the text replenished with illustrations, whose aim is to grasp child´s attention and help them orientate better in the story, or to make some biblical facts, such as dwelling, appearance and clothing of characters or the surroundings in which the story takes place, more clear with the help of illustrations. (Kovalčík, 1993, p. 301-308).

Nowadays, we can experience the biblical stories also in an untraditional way - comic book[2]. It is generally very popular among child´s readers due to its simplicity, clarity and action. In the publication *Komiksy pre zábavu a zamysleniu* (Comic book for fun and speculation), for the first time in 2003 in the publishing house FATYM, we can find totally sixteen comic strips which mostly relate to the topics of truth and justice, thus generally valid moral principles. However, two stories from the Comic book by Záhradník are of purely biblical nature: *How was it at first Christmas and what happened at Easter.* Author bases it directly on biblical issues. The first one is starting with the journey of Mary and Joseph to Bethlehem and birth of Jesus Christ and finishing by narrator´s words: *„When Herod in year 4 BC died, the Holy Family returned to Nazareth. Jesus was growing up there up to his thirteenth year...“*(Záhradníček, 2006, p.22). In the second one, author deals with the New Testament events like birth, death and Resurrection of Jesus, as well as spread of Christianity. Both comic stripes are well organized and the author respects the biblical language. Comic strips publication has also influenced spreading the idea to point at the biblical text as a fairy-tale one.

Despite certainly positive modern publications, we must beware of putting the Bible on one level with comic books and fairy tales. Therefore, it must be highlighted at the RE lessons that as for the Bible, there are historical events, which may be substantiated by archaeological or out-of-Bible acts.

3. Conclusion

Object of Christians´ belief is God. And the God used the Bible to show us what He is like and how we can learn Him. The Bible is not only a book of inspirations. Through the Bible we can understand life and God himself. It does not give us answers to all of our questions but to plenty of them. It encourages us to address God to get power and direction in life and to enjoy his love to us. And the last but not the least, the Bible talks about how we can get eternal life through Jesus Christ. Thus, it is not a fairy tale at all, but a direction showing a path to correct life.

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[2] Comic strip means sequentially organized gradual pictures or similar signs (apart from cartoons) which exchanges information (mostly narrates a story or describes a plot) and is affecting the reader aesthetically. Pictures are mostly drawn and mostly some text is added. The text may be placed in the so-called bubbles in the middle of the picture or may be in marginal part of the picture.

DIDACTIC SITUATIONS IN MATHEMATICS AS A TOOL FOR TEACHING THE CZECH LANGUAGE

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Abstract: *The paper focuses on the theory of didactic situations in Mathematics and their subsequent utilisation in the teaching of the Czech language. It describes a priori analysis as a tool in the didactic process of teaching Mathematics — with the mathematical "Puzzle" game serving as the basis for individual activities in teaching the Czech language to pupils in the fifth grade of primary school.*

Keywords: *didactic situation, Mathematics, didactics of the Czech language, a priori analysis, applications*

1. Introduction

Mathematics is an exact natural science, dealing with logical operational thought, numerical operations, the solution of word problems, description of basic geometrical objects, proofs and other principles. A characteristic feature of Mathematics is the emphasis on the absolute accuracy of methods and the irrefutability of results. These features which distinguish Mathematics from other scientific disciplines can be implemented into the didactic process of teaching the Czech language. These include, in particular, sophisticated logical processes and thought operations. Maths, as a science with an affinity for knowledge and understanding, is also concerned with creating abstract entities[1] and the search for principal relationships between them. Šmejkalová states: *"The difference between the Czech language and Mathematics, of course, lies in the fact that, for the average user, while Mathematics is basically axiomatic and stable (two and two were, are and always will be four), language as a phenomenon closely related to the phylogeny of mankind, is variable. In addition, the number of phenomena that are traditionally the subject of teaching is primarily a matter of convention (typically, lexical spelling). Moreover, the Czech language is irregular, as is evidenced by the many exceptions and variations."* (Šmejkalová, 2012, pp. 44–45).

Despite this fact, it is possible to find phenomena that are also universal in language. It is precisely such phenomena, or the understanding of them, that can become the subject of a *didactic situation*.

1.1 Didactic situation in Mathematics

Firstly, it is necessary to clarify what is meant by a "didactic situation"[2]. A didactic situation is the situation in which a teacher achieves educational goals through the overshadowing of his or her own role, while transferring part of the teacher's responsibility for the learning process to the pupils. Pupils find and discover something on their own, without outside interference, create a model and check its accuracy and usefulness. Thus the pupil becomes responsible for obtaining the desired results, and for constructing knowledge alone through problem solving. The teacher further utilises and develops this knowledge. An important phase in the teaching situation is the stage where pupils themselves attempt to formulate their own strategies and, if necessary, to explain them to others[3].

In the field of didactic situations, the term *a-didactic situation* is used, which has the purpose of enabling the pupil to acquire knowledge without overt intervention by the teacher. A related term is *devolution*, which is the process by which the teacher passes the responsibility for the act of learning on to the pupil.

The a-didactic situation consists of three stages:

- *action* – the result is an expected (implicit) model, strategy, initial tactics
- *formulation* – formulation of the conditions under which the strategy functions
- *verification* (validation) – verification of the validity of the strategy

Another important concept is *institutionalisation*, within which the pupil him- or herself draws up a strategy for solving various problems applicable to various problem situations.

The contribution of the theory of didactic situations to the didactics of the Czech language can be seen in the following areas:

- influence on the model of pedagogical communication in teaching the Czech language;
- contribution of the independent formulation of educational strategies for the development of communication skills and language literacy of the pupil;
- benefit of independent formulation of educational strategies in the achievement of the cognitive objectives of language teaching.

[1] Entity (from Latin *entitas, ens* – being) *filos.*, the essence of things, ability to exist, existence

[2] The opposite of a didactic situation is a "*non-didactic situation*". Under the concept of *non-didactic situation*, we understand such a situation in which there is no intention to teach. Examples include situations from daily life when no teaching is expected (but may happen coincidentally).

[3] *Ibid*., pp. 45-46.

The proportion of and competition between natural and didactic situations may be perceived as a specific problem of teaching the Czech language, when we want to combine the known experience by the pupil, in natural way (communicatively) acquired language, with the conscious adoption of the language. Hájková states that *"...the pupil gradually uncovers a certain reality, gets to know it, i.e. constructs his or her knowledge of it and then formulates a summary, a conclusion and a definition, with the help of the teacher. In other words, the pupil becomes familiar primarily with his or her own content of the activity and only then the definition, or verbalisation of this activity..."*[4]
Thanks to the spontaneous alignment with the linguistic competence of the pupil, as well as with his or her preconcepts[5], it is possible to:

- use natural language situations, define their relationship to didactic situations;
- elaborate the preparatory process of transforming natural situations into didactic situations;
- identify parts of the language curriculum/schoolwork on language suitable for being made the subject of a didactic situation.[6]

1.2 A priori analysis

A priori analysis is one of the most important tools for teaching situations. It is carried out by the teacher before the start of the didactic process. The teacher attempts to prepare a plan of activities, estimates the actual course of the teaching process, suggests the division of the lesson into separate phases, thinks about possible reactions and attitudes of the pupils and thinks in advance about his own possible reactions to them. At the same, the teacher examines the strategies of solving problems that may arise during the teaching process and considers what knowledge and findings are essential for the strategy and which of them pupils will be able to apply spontaneously. This method has a great informational value for the teacher, highlighting the potential pitfalls of the lesson and the possible difficulties that pupils may face in solving the tasks.
A priori analysis[7] was originally part of the didactic process of Mathematics teaching, where this method is applied during the explanation of fractions and decimals (Novotná[8], 2006, pp. 17– 22).

In the following section, we present *a priori analysis* of "Puzzle", a task which is taken from the publication (Brousseau[9], 1981).
Instructions for the "Puzzle" task (intended for 5th-grade pupils)

- Pupils are divided into four- to five-member groups.
- The teacher:
  - gives a puzzle to each group;
  - hangs up (or draws on the blackboard) an enlarged copy of the puzzle;
  - writes on the blackboard: 4 cm → 7 cm.
- The challenge is to produce similar puzzles that will be larger than the given model.
- Pupils must observe the following rule: a piece that is 4 cm in size in the model must correspond to 7 cm in the new puzzle.
- Each pupil produces one or two pieces of the puzzle.
- After the termination, pupils should be able to assemble the same shapes as those made with the model.
- After a brief discussion within the group, pupils each work on his or her puzzle piece individually.

2. The application of *a priori analysis* to the didactic process of teaching the Czech language

A priori analysis can be well implemented in the didactic process of teaching the Czech language at primary school (see activities below). As a basis, we employ the didactic "Puzzle" game, which is used as a means of understanding specific mathematical concepts.
Work with conjunctions (intended for 5th-grade pupils)

- Pupils are divided into four- to five-member groups.
  The teacher:
  - gives 5 sentences to each group (see below);
  - writes the sentences on the blackboard.
- Pupils substitute conjunctions with other conjunctions and observe how the stylistic character of the given sentences is, or is not altered.
- Pupils should be able to construct their own sentences and replace the conjunctions used.

Example sentences:
Ondřej does not know <u>whether</u> he will be able to come.
The repair took them a long time, <u>although</u> they had not interrupted their work at all.
Peace would be maintained <u>if</u> all people strived for it with equal sincerity.

[4] Hájková, 2012, p. 70.
[5] Kucharská explains: *"...creation of concepts is connected with experience acquired by the child from the earliest developmental stages. The child lives in the world of people and is learning to understand this world. Understanding the world is connected with the development of cognition, i.e. cognitive functions…"* (Kucharská, 2012, p. 44).
[6] I*bid*., p. 46
[7] Charnay (2003) deals with *a posteriori analysis*, i.e. analysis which is carried out after teaching a specific lesson.
[8] The publication by J. Novotná is devoted to the preparation of didactic situations, i.e. situations in the classroom whose purpose is to teach pupils something. Attention is devoted especially to the preparation of such situations during which the teacher transfers part of the responsibility for the teaching process, i.e. part of his/her powers, to the pupils. Pupils then discover specific findings on their own. Their activity is based only on the environment and their knowledge, but not on the didactic activity of the teacher. The pupil becomes responsible for obtaining the required results. The task of the teacher is to prepare such a situation and to institutionalise the acquired information. These findings are subsequently used and developed by the teacher.
[9] The Theory of Didactic Situations in Mathematics (TDSM) was suggested by Guy Brousseau, Professor Emeritus at IUFM d'Aquitaine and Université Bordeaux II in France, a holder of the Felix Klein medal. He worked on his theory already from the 1970s and introduced it in a comprehensive form for the first time in 1986. Gradually it was also positively accepted over the borders of France. In the beginning, its wider dispersal was prevented by the fact that most of the works were only published in the French language. However, this situation has recently been changing and the theory is also making its way into other European countries (e.g. the United Kingdom, Slovakia, the Czech Republic). It has also evoked great interest in the French-speaking part of Canada and other francophone countries.

The weather was cloudy, but warm.
We achieved success, although various obstacles got in the way.
Object and complement subordinate clause (intended for 5th-grade pupils)

- Pupils are divided into four- to five-member groups. The teacher:
  - gives 7 sentences to each group (see below);
  - writes the sentences on the blackboard.
- The task of the pupils is to change the complement clause into an object clause.
- Pupils should be able to create their own example sentences and realise whether the stylistic character of the given sentences is or is not altered.

Example sentences:
He watched the bees quickly flying into the hollow tree stump.
I heard Grandfather entering his study.
The girls watched the boys playing football passionately.
I saw the dog eagerly looking out for his master.
The teacher noticed Tomáš copying the homework.
I saw sparrows pecking small seeds from the feeder in the park.
Suddenly we saw Anna gracefully jumping over a skipping rope.
Congruent and incongruent attributes (intended for 5th-grade pupils)

- Pupils are divided into four- to five-member groups. The teacher:
  - gives 6 sentences to each group (see below);
  - writes the sentences on the blackboard.
- The task is to substitute incongruent attributes with congruent attributes.
- Pupils should be able to create their own examples and explain whether the nature of the communicated information has changed.

Example sentences:
During the break, the joyous laughter of children echoed in the school hallway.
The barking of a dog was heard from the courtyard.
The observation tower on Petřín Hill is 60 metres high and is a copy of the Eiffel Tower in Paris.
The path across the field seemed shorter to us than the route through the forest.
The Chateau in Lednice is one of the most visited locations in South Moravia.
The juice from carrots is very important for our health.
Verbal forms (intended for 5th-grade pupils)

- Pupils are divided into four- to five-member groups. The teacher:
  - gives 6 sentences to each group (see below);
  - writes the sentences on the blackboard.
- The task is to substitute forms of the verb *to be* with verbs with a full meaning.
- Pupils should be able to provide their own examples and explain whether the replaced sentence is identical or not.

Example sentences:
There were many beautiful flowers in the garden.
We will be at the station in time.
Grandpa's violin was on the shelf.
There is a bowl of fruit on the table.
There are many surprised people in the building.
The plane was already on the runway.

Number citations consecutively in square brackets [1]. The sentence punctuation follows the brackets. Refer simply to the reference number, as in [2]. Do not use "Ref. [3]" or "reference [4]". The reference list at the end shows examples of journals, proceedings papers, books and web link. Footnotes are not to be used.

Give all authors' name; do not use "et al." papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished". Papers that have been accepted for publication should be cited as "in press" or "in print". For papers published in non-English journals, please give the English citation first, followed by the original citation. Only the cited papers or books in the main text appear in reference list.

3. Conclusions

The theory of didactic situations and its implementation in Czech language teaching seems to be effective and beneficial. Pupils themselves become familiar with the issues of the exercises, use logical and intellectual operations, and get to know various linguistic phenomena without the teacher's direct intervention in the explanation. They also learn to think constructively, analyse different problem situations and critically assess their performance and the performance of others.

The connection of the Czech language to Mathematics is in many ways inspirational, as well as a challenge for teachers of other subjects. Teachers should always be interested in these methods, promote new trends in education, as well as develop the creativity of pupils and their interest in the taught subject

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CONSIDERATIONS AROUND THE DEVELOPMENT OF POLITICAL DISCOURSE

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Abstract: *The public communication domain has always been dominated by the language of politics. As a result, political discourse has become one of the components of culture. This paper aims to present a discussion of selected theories and approaches that have contributed to the development of political discourse and broadened its understanding. Attention will be paid to the historically elaborated features of political discourse and the tools used as instruments to increase power in addition to conveying knowledge about the world suggestively and subjectively.*

Keywords: *political discourse, language of politics, rhetorical devices, metaphor, speech*

1. Introduction

Language has multiple functions: expressive, informative, etc. The language of politics is based on one particular function of the language, i.e. persuasion. Persuasion is designed to change the attitudes and beliefs of the recipient, and – ultimately – his actions. Due to the fact 'rhetoric' has ancient roots, the art of effective speaking and writing, also including persuasion, is one of the oldest disciplines. Indeed, in all public appearances oral or written artifacts of rhetoric are significant, and this is a consequence of the fact that they are so often repeated that they become imperceptible to an ordinary receiver.

2. The phenomenon of communication

The simplest definition of the phenomenon of communication states that communication involves a sender (encoder) and a receiver (decoder). The former encodes a message, deciding what content and relationship codes to use, and then sends it through a communication channel such as face-to-face (verbal and non-verbal) or written (frequently using electronic technology).

As stated by the American non-verbal behavior researcher Albert Mahrabiana, 55% of information is derived from non-verbal communication, 38% from tone of voice, and only 7% from the verbal messages themselves. As evidenced by numerous scholars, verbal communication forms a relatively small part of the message transmitted from sender to receiver. Unquestionably, the frame rates are not fixed and depend on context. Non-verbal communication includes body language, time, space and appearance. These elements consist further of: gestures, facial expressions, body posture, touch, communication distance zone, smell, eye contact and appearance. Non-verbal communication reflects our attitude toward others, our emotional state, and sometimes even our material condition. Non-verbal signals can reveal our intentions, but they are also able to camouflage them. According to some scholars, e.g. Charles Darwin, non-verbal communication is the most original and congenital form of communication, because of the fact that people used gestures for communication purposes even before speech emerged.

3. The definition of speech

Important aspects of political discourse include the principle of expression defined by J.R. Searle, and the speech act hierarchy defined by J.L Austin. These provide some key terms, for instance locution and illocution.

Another key term is 'speech'. Some studies use the term 'utterance' to refer to speech. In pragmatics these underlined the essential language skills, involving social knowledge and the ability to communicate with other people [1]. The theory of speech acts was propounded by the Oxford School group of linguists on the basis of a series of lectures delivered by John L. Austin, where gave an overview of his theory of performative acts (1953). His book entitled *How to do things with words* (1962) contains a discourse about the nature of speech acts, their characteristics, component parts and their division. Thereafter, many linguists argued with Austin`s theory, adding some new concepts, as well as proposing new solutions to this problematic issue. The most important followers of Austin's study are such scholars as: John Searle, Peter Strawson, Paul Grice and Anna Wierzbicka who introduced speech act theory to Poland in the 1970s. J.L Austin divided speech acts into performative and constative. According to his proposition, an expression is performative when a sentence contains verbs in the first person singular present indicative active. The label is derived from 'perform', the usual verb with the noun 'action' [2]. Performative speech contains specific verbs (performative verbs), however it is worth adding that speech formulated without the use of performative verbs may also occur.

There are also sentences that do not include performative verbs, but can have an attached performative force. Austin distinguished these types of utterances as explicit and implicit performatives. It should be stressed that those utterances containing sentences in the performative cannot possibly be false, and therefore cannot be legitimately described as true either. Austin stated that implicit performatives are ambiguous with regard to the act they perform and concluded that implicit performatives must be examined by relating them to the correct explicit performative [3]. Another important issue considered by

Austin refers to the identification of speech without explicit performative qualities. Austin noticed that the conditions of promising are clearly based on the normal use of the verb promise. He stated that a complete account of the conventions of illocutionary acts relies on a complete account of the meaning of the performative verb. Austin called primary performatives those simple sentences that correspond to basic types such as declarative, interrogative, and imperative. Moreover, he noticed that some expressions may have explicit counterparts as well and can be explicitly paraphrased. He added that performative verbs are very important for utterance interpretation because of the belief that all primary (or implicit) performatives have explicit counterparts. Austin`s speech act hierarchy includes: 1. locution; 2. illocution; and 3. perlocution. Locution is a phenomenon based on using a certain language code, which creates a specific expression, without taking into account the situation and the participants of the given speech act. Three aspects of locution can be distinguished: phonetic (articulation of sounds), factual (correct pronunciation of sounds in a grammatical manner), and usage of words in context and a reference. Thus, the locution action is based on sound articulation, and combining morphemes and words in a finite creation. Illocution refers to the intention of the broadcaster, which results in saying certain words. On the other hand, the effect of perlocution can be mental. It can cause emotional changes which can be evinced from the response of the recipient (amusement, contempt, anger, change of decision, and suppression of action), a specified action being performed or statement reaction [4]. Later scholars noticed that Austin`s taxonomy had some weak points. Regarding "illocutionary force" Austin distinguishes several categories: 1. verdicatives – including judgements, evaluations and views made either by judges or arbitrators or in everyday expression. Presentation is related to facts or values. Example verbs in this class are: acquit, hold, calculate, describe, analyze, estimate, date, rank, assess, and characterize. 2. exercitivies – one of these "is the giving of a decision in favor of or against a certain course of action on advocacy of it...", "a decision that something is to be so, as distinct from a judgment that it is so" [5]. Examples are: order, command, direct, plead, beg, recommend, entreat and advise. Some scholars emphasize the fact that Austin omits request, which is also an obvious example.

Following Austin`s theory, Searle evaluated the felicity conditions of illocutionary acts. He proposed that a performative verb corresponding to each possible act must exist. Illocutionary acts proposed by Searle carry the functional notion of representing. Moreover, in his theory the force of a speech act is separated from its content. In explicit performatives, separating the performative verb from the proposition that it takes is essential. Symbolically, we might represent the sentence as containing an illocutionary force-indicating device and a propositional content indicator. To sum up, despite some critical voices, J.R. Searle's taxonomy of speech acts is considered more useful, because it avoids the difficulty of reliably connecting an illocutionary act to a performative verb and having to account for the ambiguity of implicit performatives.

The discussion below will present the characteristic features of discourse, preceded by some remarks connected with the circumstances in which the discourse is used.

4. Various concepts of discourse

According to Lakoff and Johnson, persuasive texts often use figurative language that is full of comparisons, metaphors and metonymy [6]. The art of persuasion was known in ancient times and its rules were first defined by Aristotle. Nowadays, one of the persuasive techniques is known as ELM (Elaboration likelihood model). This is a theoretical model of the persuasion process and its subject are the mechanisms employed to change the attitude of the receiver, such change being the result of the message received from the sender. The persuasive effect can be achieved as a result of the use of arguments.

Two types of argument can be distinguished: weak and strong. Moreover, according to ELM theory, the personality of the receiver and the context are often very important. According to Aristotle, the arguments in a speech should be presented in an order – from the weakest to the strongest. Another famous philosopher, Socrates, used a rule based on asking the questions – the opponent was asked several questions and was thereby led to conclude in the way the interlocutor wanted. The famous orator Cicero used a similar method, but he would ask questions which included a hidden hypothesis. In the 20th century American psychologists proved that the order should be reversed. According to contemporary theory, those speeches that start from the strongest arguments are most influential, because their effectiveness is greater [7].

5. The features of a discourse

It should be stressed that there were many philosophers and scholars who considered the function language plays in a society. The issue of the linguistic characteristics of a discourse occurs in numerous studies. Discourse requires the use of some characteristic devices and figures. According to Brown & Yule, the language of a discourse has to fulfill two main functions: transactional and interactional. The first function refers to the situation where language is used to express content, whereas the second refers to expressing social relations and personal attitudes [8]. This distinction refers to the dichotomy that had been previously made by Buhler (1934) who divided the functions of language into representative and expressive categories. Moreover, numerous persuasive techniques are used. Indeed, language can play numerous communicative functions. However, as Brown & Yule mention, language also fulfills a very important informative function, which refers to our cultural mythology.

As these scholars state, it is due to language that the human race has been able to develop different cultures. Especially important here is the written language, which helped to develop philosophy, science and literature. This

was possible due to the fact that language is able to transfer information. This aspect of language is called 'primarily transactional language' and it refers to that language function that is directed at conveying messages; hence, it is called 'message oriented' language. On the other hand, in a wider perspective, language is understood as a tool for establishing social relationships, the so-called "phatic" use of language. Jakobson (1960) added the emotive function, and then Halliday (1970) mentioned such functions as: ideational and interpersonal; finally, Lyons (1977) added the function called descriptive (social–expressive). According to Biber & Gray, who analyzed the linguistic features of a discourse, the typical discourse contains collocations based on such verbs and phrasal verbs: get + rid, give + an assignment, have + the chance/ a good day/ a problem/ the opportunity, Take + an exam/test/ care/ part, get + along/ better/a job/ good grades, give + an example, have + an ability/an advantage/a choice/ no interest/ an opinion/a problem/ time, make a decision/ money/sense, take care/ classes/ course/subjects/ care of [9]. Apart from this, language often emphasizes an expressive function. Below it will be shown how language tools, especially the devices used in speeches and discourse, function in contemporary political rhetoric.

6. The characteristic features of political discourse

Political discourse has some characteristic features. First of all, it is worth mentioning that the connections between politics and discourse are very rigid. As stated by David Bell, each human being is a political being. The same author adds that politics is a special kind of communication, in which the public should carefully consider who speaks to whom and what the subject of the discourse is [10].

Schaffner claimed political speeches are not a homogeneous genre [11]. Lakoff (1990) noted that all political speeches are based on similar language tools. This refers to the special way of saying, and to the use of some special adjectives, as well as to the use of figurative language to explore some topics. With reference to Fillmore, Lakoff underlines the fact that political speeches are characterized by framing [12]. Moreover, Lakoff together with the other scholars from the Rockridge Institute described the way in which language influences the terms of political debate [13].

In the so-called "political framing" each word is related to the overall of conceptual framework of the speech. Explaining the term "conceptual framework," Lakoff states that it means "the mental structures that determine how we understand the word" [14]. The result is that a new understanding of political issues is created that produces new demands for concrete actions.

Moreover, Lakoff analyzes Schwarzenegger`s speeches, where he built sentences in such a way that it was clear that Democrats are against people. Analyzing Schwarzenegger`s speeches, Lakoff describes the framework of conservative thought, claiming that the common recurring issue is the conviction that the world we live in is not only dangerous, but also difficult. In such a vision, the role of the authority is to defend families and be like a father for every citizen. [15] Obviously, there is a clear difference between oral and written discourse. According to Locke and Simpson text analysis involves such areas as vocabulary, grammar, cohesion and intertextuality.

As far as vocabulary is concerned, the following issues are of importance: formal and informal language, metaphors, expressive values and wording [16]. Grammar involves modality, transitivity, types of verbs, voice and pronouns. Cohesion consists of such aspects as: connections, argumentation and parallelism. On the other hand, the term intertextuality refers to such items as: allusion, reference and quotation. The analysis of syntax refers not only to verbs and such characteristic features as modality, voice and transitivity, but it also involves pronouns and conjunctions. The highest level of text analysis involves argumentation and parallelisms, as well connectives.

7. Rhetorical devices in public speaking

Among the numerous devices that are used in public speaking the most often encountered are: alliteration, allusion, amplification, anadiplosis, analogy, anaphora, anastrophe, antistrophe, antithesis, assonance, asyndeton, chiasmus, climax, diacope, eponym, expletive, hypophora, hyperbole, litotes, meiosis, metabasis, metanoia, simile, parallelism, polysyndeton, praeteritio, scesis onomaton, sententia, symploce and ticolon.

It should be stressed that a very important language device, occurring mostly in figurative language, and often used in political speeches is metaphor.

The theory of metaphor has deep roots; however, most important here is the cognitive theory of metaphor. It should be mentioned that cognitive linguists have observed that most important is not the structure of a language, but the meaning. For cognitive linguistics, language is symbolic in its character and this can be seen on all its levels: morphology, syntax, lexis and pragmatics.

George Lakoff and Mark Johnson, in the book entitled "Metaphors we live by" pointed out that the literal meaning of a sentence constitutes only from two to five percent of all types of constructions used in customary acts of communication [17]. Lakoff and Johnson noticed that a great number of metaphors are connected with spatial orientation: e.g. up-down, in-out, front-back, and on-off. These metaphors play an important role in our physical and cultural experience. Selected examples of such metaphors are: e.g. HAPPY IS UP, GOOD IS UP, BAD IS DOWN, VIRTUE IS UP, SICKNESS IS DOWN, MORE IS UP. These authors, whose book revolutionized the traditional view of metaphor, stated that metaphors are nothing but "understanding and experiencing one kind of thing in terms of another." Giving examples of such metaphors as "Argument is war" and "Time is money" they showed that we often talk about time in the categories we use to talk about money-such metaphors are evidence that we have a coherent system of metaphorical expressions to use in our everyday life. The first of the above metaphors can be seen in sentences such as: "His

criticisms were right on target"; "If you use that strategy, he`ll wipe you out" [18]. As Lakoff and Johnson state, metaphors such as "Time is money" form a coherent system based on subcategorization.
It appears in sentences such as: "I don`t have the time to give you"; "I`ve invested a lot of time in her." This kind of metaphor is based on the fact that in our culture time is considered a valuable commodity [19]. Among the rhetorical devices used in political speeches words such as "people," "we," and "must" are frequently used.

8. Conclusions

Language has always been used as an instrument in politics. The power of language is of great importance. History shows that various political systems frequently rely on similar language tools to achieve their goals and political communication is a process that becomes a part of social communication.

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A FEW EXAMPLES OF DEATH PENALTY IN ROMAN LAW

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Abstract: *This article briefly deals with the issue of penalties in Roman law. It refers to sentence development and defines basic terms connected with punishment in ancient Rome. The author of the article points out the selected types of death sentences by using the specific examples reflecting the real application in practice. Article enshrines the importance of funeral perception of the afterlife former Roman society in the death penalty and its prohibition in connection with selected sentences such as punishment post mortem. These facts point to the typical blending fas and ius in Roman law as one of its basic characteristics.*

Keywords: *death penalty, Roman law, execution, criminal law*

1. Introduction

Criminal law was also a part of the Roman law. In Rome, in the oldest period, many social distortions were dealt within the family – family discipline, whereas, public authority dealt with the case very rarely. Later, however, began to emerge reprehensible acts that disturb the public order, thus encroaching upon the interests of the inhabitants of Rome, especially its ruling class. For these reasons, it was necessary to develop and begin to apply the law and repressive means to prevent such acts. Gradually, the range of offenses – *crimina* and the range of all types of criminal offenses with it began to extend. Sentence was largely an effective deterrent. Criminal proceedings were called the public ones, because they were allowed to carry out to any member of their people. Several criminal cases were capital, which meant that for these the death sentence was awarded or prohibition of fire and water, or lifelong exile on the island or in mines. Other criminal cases in which the offender was sentenced to the loss of honor or disabled with property offenses were also considered as public criminal proceedings, but did not belong to the group of capital proceedings. [1]

It was Roman law, which introduced the typical criminal principles such as *nullum crimen sine lege* and also the principle of *nulla poena sine lege*. [2]

2. A brief look into the history of punishment in Roman law

The term used in ancient Rome in connection with the sentence was *talio*, representing retaliation. This term meant the same criminal mischief for perpetrator as he committed to the victim. It was one of the phases of development of choosing the option of killing the perpetrator or taking a fine from him. It was the embodiment of the idea that the perpetrator must endure for his transgressions the same physical pain as the victim suffered from. A similar meaning for the most serious crimes in Roman law bears the term *poena* which had its basis in Greek and which highlights in particular the sacred elements – cleansing the society from crime by dedication of an offender to deity. Penalty – *poena* does not always match the committed crime. In comparison with the presence, therein substantially it reflects the nature of revenge with intimidating effect. Therefore, the death sentences were often implemented, usually associated with the loss of property – convicted offender had become a victim of gods by the religious beliefs and his assets was imputed to the temple of the god. [3]

These facts were typical features of blending *fas* and *ius* in Roman law, where religious elements entered to the law itself and thus influenced public policy. As time goes the law has begun to exempt purely ecclesiastical character, even if some of its elements retained. Similar to distinguish the perpetrators but also accomplices, in Roman law is that whoever has participated in a criminal offense (*particeps, socius*), whether natural or other help, instructions or incitement, was considered the same culprit as the main offender and was therefore punished as well as the perpetrator. [4]

3. Selected types of death penalties in Roman law

As noted above, the punishment was largely an effective deterrent in Roman law intimidate of consideration and should arouse menacing impression, until the post-classic period. For these reasons, it was not unusual for such frequent application of the death penalty for the crimes that do not correspond that. At this point it is important to note that as mentioned earlier, the Roman law was in the certain time under a strong influence of religion, the deities in the legal field too, and it had also a great importance for the punishment. The death penalty was often associated with the so-called *post mortem* punishment, which was about to punish the offender, even after the death. Romans believed that a person who has not been properly buried was in addition to the death penalty execution, doomed to eternal wandering of her soul. In the following chapters there are some typical methods of capital punishment for various crimes in the days of the Roman Empire.

3.1 The death penalty for patricide or matricide

Death penalty, which was considered one of the most heinous one, was punishment for patricide or matricide – *parricidium*, which included caning of convicted and then sewing him into a bag with viper, cock, monkey and dog.

Thus sack was thrown into the nearest sea or thrown to wild animals if the execution did not take place near the sea. The Romans believed that when the body of the offender has not been destroyed, it should not remain of everyone's eyes for the shame, and that was the main reason why it was thrown into the sea. [5] This sentence in itself carries many religious elements, because the Romans believed that the souls of the dead could not break through the water and was executed among other things, denied the opportunity to find eternal peace. Cicero wrote to this sentence: *„O singularem sapientiam, iudices! Nonne videntur hunc hominem ex rerum natura sustulisse et eripuisse cui repente caelum, solem, aquam terramque ademerint ut, qui eum necasset unde ipse natus esset, careret eis rebus omnibus ex quibus omnia nata esse dicuntur? Noluerunt feris corpus obicere ne bestiis quoque quae tantum scelus attigissent immanioribus uteremur: non sic nudos in flumen deicere ne, cum delati essent in mare, ipsum polluerent quo cetera quae violata sunt expiari putantur; denique nihil tam vile neque tam volgare est cuius partem ullam reliquerint.Etenim quid tam est commune quam spiritus vivis, terra mortuis, mare fluctuantibus, litus eiectis? Ita vivunt, dum possunt, ut ducere animam de caelo non queant, ita moriuntur ut eorum ossa terra non tangat, ita iactantur fluctibus ut numquam adluantur, ita postremo eiciuntur ut ne ad saxa quidem mortui conquiescant. Tanti malefici crimen, cui maleficio tam insigne supplicium est constitutum, probare te, Eruci, censes posse talibus viris, si ne causam quidem malefici protuleris?"* [6]

This penalty also regulates Digest 48th book, in which a lawyer Modestinus wrote: *„According to the custom of our ancestors, he punishment instituted for parricide was follows: A parricide is flogged with blood-coloured rods, hen sewn up in sack with dog, a dunghill cock, a viper, and a monkey; then the sack is thrown into the depths of the sea. This is the procedure if the sea is close at hand; otherwise, he is thrown to the beasts, according to the constitution of the deified Hadrian."* [7]

The very idea of punishment is terrible, therefore, it was applied in such serious crimes, like the killing of a relative certainly was. In addition to mentioned punishment Marcian listed the number of relatives whose killing resulted in the imposition of the death penalty. That sentence thus affected the person who killed not only mother or father, but also grandfather, grandmother, brother, sister, cousins in the first place, but also the father-in-law, mother-in-law and so on. [8]

Provision governing the death penalty and the offense continues: *„Truly, if anyone kills a parent in a fit of madness, he shall not be punished, as the deified brothers wrote in a rescript in the case of man who had killed his mother in a fit of madness; for it was enough for him to be punished by the madness itself, and he must be guarded the more carefully, or even confined with chains."* [9]

3.2 Other kinds of death sentences

Typical death penalty included the death penalty by burning – *crematio*, which various offenses were criminalized, the most common offense arson, which was a clear example for consideration of the death penalty, which carries the principle of "an eye for an eye, a tooth for a tooth" in itself.

Another death penalty was for instance the dropping out of the rock sentence. The case of Maria Sexta, the largest Hispanic rich man, was guilty of incest with his daughter, and for this reason he was punished by the dropping of Tarpej rocks. Emperor Tiberius, who sentenced him then kept the gold and silver mines for himself, even though the state confiscated them formally. He wanted to show the people that his great fortune actually destroyed him and brought him such a disaster and death. [10]

The procedure in case of application of the death penalty by hanging or decapitation, which was also relatively frequent death penalty, was very interesting. In some cases, as a warning for people there used to hang a head on the wall or on rounds. In Roman history we meet with cases of committing a crime of terror for which this penalty was imposed, the execution took place in front of the people, the execution of the offender to become his head and subjecting it to the place of execution, on top of a column or wall, as a warning to others. [11]

The group of death sentences awarded in Roman law is closed by – enforcement of the sentence in the form of crucifixion, the burial alive, stoning, thrown to wild animals in the circus or conviction for wrestling in the gladiator school.

4. The punishment of exile or keeping on a desert island

The history is quite often applied expulsion, banishment (exile) or kept in an abandoned area or desert island as a punishment, too, which was enshrined in the Digests. [12] Although it was not a typical death penalty and can be classified as liberty penalties, its connection with the ban on burial in their homeland under Roman law makes it different from other criminal records. Under this punishment the offender was punished not only alive, but even after death. The lawyer Macianus wrote in Digests, the one who was sentenced to deportation to the island or elsewhere, was also convicted of post-mortem, which meant that the sentence of convicted continued after his death, because the possibility of burial of his remains in the country was subject to the approval of the monarch. This was for a convicted perhaps the worst punishment, along with the notion that not only spends his life in exile, but even in death he will not be able to return to his homeland. In Roman law, the horrible manifestation of inhumanity was when someone could not be properly buried with all the funeral ceremony. In regard to this punishment the case of a woman Lollie Pauline is known, who was, as reported by sources, sentenced penalty of banishment, without the possibility of burial in her homeland. Thus, she not only had to spend all her life in exile, but even after her death her remains could not be brought into her country. An act that was committed and the punishment that it missed was the temerity to compete for the marriage of the emperor Claudius with another woman, Agrippina. Lollia was portended by an astrologer and magician the marriage with the Emperor himself.

Agrippina, who became the wife of the Emperor Claudius, the proceedings of Lollie did not like and persuaded the emperor to get her cast into exile. Her sentence was eventually seizure of all assets, expelled from Italy and following it was sent to the tribunal which it had to catch up to death. A few years after the death of Lollie, Emperor Nero allowed to import her ashes from exile and carried out the appropriate funeral rites. [13]
This punishment was also covered in Cornelius Act of assassins and those who served poisons, their deportation to the island coupled with confiscation of all property. [14]

5. Conclusions

From the origins of Rome to the Justinian codification we can see quite a significant development in the field of criminal law. By applying a "criminal policy" at homeland, through the creation of public authority prosecuted offenses defined to a wide range of penalties. Punishment in Roman law had several meanings, but unlike the current humanizing punishment was in ancient Rome, especially the element of retaliation, which resulted in many cases of favouring the death penalty from the penalty on the liberty or property crimes. The Influence of Roman law on legislation, whether in criminal or other areas, can also be seen today. It was the famous Roman jurists like Ulpian, Marcian, and Paul, who through their multiple fragments enshrined still applied principles that built the basis for criminal proceedings.

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DEFINITION OF THEFT IN THE ROMAN LAW AND IN ACTUAL LEGAL SYSTEM OF LAW OF SLOVAK REPUBLIC

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Abstract: *Theft is one of the oldest unlawful acts committed by human beings. In particular stages of evolution the society and legal system of law, understanding and interpretation of individual wrongful acts including the theft changes, and not just their legal qualifying, process of punishment, but also their classification as public wrongs or, on the other side, as civil wrongs. The prefatory part of this paper is dedicated to general differences between the terms crimina publica and delicta privata. The aim of this paper is to point out to defining the theft in the roman classic law and Justinian roman law, where the furtum was belonging under delicta privata and consequently to definition of the body of theft in actual legal system of law of Slovak republic, that defines theft as a criminal offence. In contrast to roman law, theft as the criminal offence has public nature.*

Keywords: *furtum, theft, Roman law, delicts, Criminal Code*

1. Introduction

The Roman Empire as a political organization passed away centuries ago, but Roman jurisprudence through its influence still remains a world power. In its modernized form Roman Law has become the law of more than three-fourths of the civilized globe, and Gibbon's words written in the eighteenth century: *„the laws of Justinian still command the respect or obedience of independent nations"*. [7]

The term *furtum* - theft derives from the word *furvus*, that means dark, for the reason that realization of such act is coming up in secret and in furtiveness and very often at night or from the word *fraus*, despicable action, or from the word *ferre*, take away, in the sense as illegal take away, or from the Greek, where *fures*, thieves, are being called *phores.*

2. Explanation of the terms *crimina publica* and *delicta privata*

Crimina publica in Roman law were wrongs against the state or community as a whole and were prosecuted before public tribunal. On the other side, *delicta privata* were wrongs against private individuals and gave rise to suits for penalties or damages. The boundary between these two groups of wrongful acts was not changeless and was moving in successive steps. The idea of public wrongs or crimes was slow in developing, however, and the long prevailing theory as to the proper method of dealing with wrongs was that the individual who had suffered a wrong should pursue his own remedy by a civil action. The growing needs of society demanded more adequate and satisfactory remedies for the suppression of great wrongs.

Some acts belonging under the category *delicta* were later considered to be dangerous insomuch that they were reclassified to the category of public wrongs – for example robbery, as well as some serious cases of *iniuria.* The difference between *delicta privata* and *crimina publica* was also in the sphere of process of punishment these acts. At the beginning of punishing the delicts was at first allowed self-help, later just established actions. In the centre of attention there is an injured party, to whom the damage was incurred, or injustice and that is why he is interested and demands punishment for the offender.

At the beginning punishment was determined by injured party; with fixation of actions also comes defined establishment of punishments that injured party could demand. In the case of acts classified as *crimina* is the sanction of the offender realized by reason of interest of the state and society of his punishment.

3. *Lex XII. tabularum*

The basis of roman public and private law became *Lex XII. tabularum* (r. 449 B.C.), that arised out of writing up (codification) of common law. Until this time the law had sacral nature and its interpreters and advisers were pontificates. *Lex XII. tabularum* has two sources. Roman tradition, law of patricians and pontificates and Greek codifications of law. It was the first and for the long period the only one listing of roman law. *Lex XII. tabularum* has never been abrogated, formally was valid until time of Justinian and we can find references to *Lex XII. tabularum* also in Digests and later comments to roman law.

Lex XII. tabularum contains also provisions of criminal law. As the most important public wrongs according *Lex XII. tabularum* were considered these: high treason, murder of free citizen, fire raising, theft of harvest, false testimony, public affront, as well as practising sorcery of any kind connected with malicious intent to harm somebody. Punishment did not have to be adequate to wrongdoing but had strong character of revenge with intimidating effect. Wrongful act aimed contra state and social structure, prosecuted according to the law by public action was the crime (*crimen*). *Delictum* was wrongful act, harm to individual person, his or her family or property by violating the command or prohibition. Delict has private nature, so the offender was prosecuted by injured party with an action. Roman criminal law had from the

beginning mixed, assorted character, i.e. as public as private character.
Plínius describes another provision of *Lex XII. tabularum*. This provision is about adult who grazed livestock at night on a foreign fundus or chopped the crop plants gained by ploughing. Such offender did not compensate the damage but he was sacrificed to goddess Cera. Theft of the agricultural products was punished essentially harder that theft of anything other - the punishment for "ordinary" theft was the fine. On the other side, punishment for the theft of corn and slaves was the death sentence. Such theft has signs of sacral crime. Injured party did not have a right to private revenge. This revenge belonged to divinity.

4. Classic Roman law

In classic roman law the bases was the definition of *furtum* in such way, as was defined by the jurist Paulus: *„Furtum est contrectatio rei fraudulosa lucri faciendi gratia vel ipsius rei vel etiamusus eius possessionisve",* that could be freely translated as follows – theft is the fraudulent interference with a foreign thing, whether with the thing itself or the use or possession of it, with a view to gain.
Compared to modern public law, classic roman law and its understanding the extent and content of *furtum* differs in several matters, for example - according to roman jurists, if somebody used or misused a thing belonging to other person otherwise than in agreed (maybe also in exerted) way, such person committed the theft. Institutes, whose author is Gaius, mention [3] as examples the situations, in which borrower, bailee or lien creditor used borrowed things other that it was agreed in advance. Another cardinal difference consisted in the fact that in roman law the theft of possession was also considered as *furtum*. [4] Equally important difference is the fact that *furtum* in so manner, as was understood in roman law, included also (in modern criminal law separate bodies of criminal offences) embezzlement and fraud.
Objective assumption of the theft is particularly capable object. [12] *Furtum* can be committed solely on moveable things or on free persons that are under *potestas* of other person. [8] In the matter of moveable things, it is assumed that particular thing is in private property. *Res nullius*, especially *res derelict* cannot be object of the theft. Also, it is not possible to commit theft on *res divini iuris* and things belonging to state, but wilful wrongful appropriation of these things is prosecuted *ex offo* as *sacrilegium*, as far as concerns divine property, or as *peculatus*, as far as concerns stealing the state property. [9]
Subjective assumption of the theft was *dolus – animus furandi* (an intent to commit the theft). So, theft at this stage cannot be committed by negligence, and not even in the case that thief mistakenly supposes that the thing he is stealing belongs to other person. Subjective conceptual sign is also intent to richen *(lucri faciendi gratia)*, on the other side, driving motive is not important.
Another objective assumption of the theft was *contrectatio rei* that means the real impact to the, real handling of it, only intention to commit the theft was not sufficient – *animus furandi* needs to be manifested outwards by certain actions.

4.1 *Furtum manifestum* and *furtum nec manifestum*

Manifest thief is not just the one that is caught up at the place where the theft was committed, for example as thief who steals in the house but has not leaved outside yet and is caught. *Furtum manifestum* is also a case when the thief together with stolen thing is still situated in public place, or on private land of the owner, or was seen and caught in the other place, before he left the place where the thing was stolen and did not bring it to the safe place. Manifest thief is not the one that brought the thing to the in planned place even if such thief was caught with stolen thing – this is the case of *furtum nec manifestum.* [10]

4.2. *Furtum conceptum* and *furtum prohibitum*

Furtum conceptum was the discovery of stolen goods in another's house after a search therein by the owner of the goods. In case stolen property was thus sought and found, the owner of the house, although not the actual thief, was liable as a receiver of stolen goods. [11]
This ancient right of the owner of stolen goods to prosecute a search within the house of a suspected person was, doubtless, connected with the owner's right to question any person suspected of having possession of the property. [13]
If the occupier of the house prevented the owner of the stolen property from making his search (*furtum prohibitum)*, he became liable to an action *(actio furti prohibiti)* given by the praetor involving a penalty of fourhold the value of the thing stolen. [5]

4.3. *Furtum oblatum*

Furtum oblatum consisted in giving stolen property to an innocent person, or in placing it in his house, in order that he might be thought to be the thief. The person who was thus imposed upon had an action known as *actio furti oblati*, carrying a threefold penalty against the wrongdoer whether he was the actual thief or not. [6] After the Institutes of Justinian was published, *actio furti oblati* became obsolete and the person guilty of *furtum oblatum* was punishable for *furtum nec manifestum*. [11].

5. Corpus Iuris Civilis

The compilation of what was adjudged to be all the ten existing law was the most important event in the history of the law of the Roman people. This great work consisted originally of three parts – the Digest (Pandect), the Institutes and the Code. The Digest was a comprehensive collection of extracts from the writings of the accepted legal authorities from the time of the Emperor Trajan to that of Constantine. The Institutes was elementary book for those beginning the study of the law. The Code was a transcript of imperial laws still recognized as in force.
According to the Institutes of Justinian, all obligations connected with delicts arise from the fact of some wrongful act (*ex ipso maleficio)*, such as *furtum* (theft), *rapina* (robbery), *damnum* (damage), or *iniuria* (injury).
Furtum, or theft, is defined in the Institutes as follows: *Furtum est contrectatio rei fraudulosa vel ipsius rei vel etiam usus eius possessionisve: φψράς quod lege naturali prohibitum est admittere. 2. Furtum autem vel a furvo, id*

est nigro, dictum est, quod clam et obscure fit et plerumque nocte: vel a fraude: vel a ferendo, id est auferendo: vel a Graeco sermone, qui appellant fures. immo etiam Greci άπό τού φέρεισ φώράς dixerunt [10] - as the unlawful appropriation of property either in its entirety, or merely for the purpose of making use of it, or of getting possession of it. Paulus, in the Digest, adds words *lucri faciendi gratia* (for the sake of gain). Words *lucri faciendi gratia* were not limited in meaning to pecuniary profit, but included any kind of advantage, gain or satisfaction, even the mere malicious pleasure of the owner's loss.

Furtum is ergo wrongful act, when the thief appropriates specific moveable thing or also a person under *potestas* of another, without permission to such handling with this thing. Such an act is committed consciously with intent to richen. According to such determination of the conception of *furtum* two conceptual attributes of theft can be deducted: *animus furandi et contrectatio rei.*

6. Definition of theft in the Act 300/2005 Coll. Criminal Code as amended

The criminal protection of proprietary rights, regardless of the kind and form of property, ensures Criminal Code especially in its part two – special part, chapter four – offences against the right of property. In this chapter four we can find criminal offences that have the only one or the primary object of the criminal offence and this object is property right or rights related to property right. That is the reason of categorisation the criminal offence of theft to the chapter four of the special part of Criminal Code, concretely in § 212.

Paragraph 1 and 2 of § 212 have following wording:

(1) Any person who appropriates a thing belonging to other by seizing it and thus causes small damage shall be liable to a term of imprisonment of up to two years.

(2) The same sentence as referred to in paragraph 1 shall be imposed on the offender who appropriates a thing belonging to other by seizing it, and

a) commits the offence by housebreaking,

b) immediately after the commission of the offence he attempts to keep possession of the thing by violence or the threat of imminent violence,

c) commits such offence on a thing that another person has on him or with him,

d) such thing is from the harvest from a land belonging to the agricultural land fund, or wood from a land belonging to the forest land fund, or fish from the pond under intense rearing conditions,

e) commits the offence on a thing whose collection is subject to payment under a separate regulation, or

f) has been sanctioned for such offence in the past twelve months. [1]

From above mentioned body of the theft it is possible to deduce elements of the body of this criminal offence – object, objective aspects, subject and subjective aspects.

Object of the theft according to Criminal Code are proprietary rights or rights related to proprietary right. Objective aspects consist in attacks to property of other foreign person described in the wording of § 212. Subject of this criminal offence is universal and is expressed by the word "who". Offender is defined in § 19 of the Criminal Code as follows: An offender of a criminal offence is the person who committed criminal offence acting on his own. Only a natural person may be considered as the offender of a criminal offence. Compulsory attribute of subjective aspect is intentional causation.

7. Conclusions

Defining the theft, its attributes and body of this wrongful act has come through radical progress since the classic roman law until present days. The most cardinal first step in this development was tendency to incorporate *furtum* into public wrongs, formal external expression of what was incorporation of *furtum* do 47. book of Digest, that was, together with 48. book, labelled as books dedicated to criminal – public law, i.e. *libri terribiles.*

Particular conceptual attributes of theft depended always on actual social situation and reflected priorities that were protected by society.

Roman concept of *furtum* was broader in scope than the modern concept of theft. It encompassed not only the actual removal of another's thing but also a diversity of acts involving intentional interference with a movable object without the knowledge of, or contrary to an agreement with, the owner of such object.

According to current criminal code of Slovak republic also co-owner may commit the criminal offence of theft if he appropriates a thing that is in his divided co-ownership, with intention to dispose with it as with his own. The other cases of theft as were defined in roman law, are in actual criminal code incorporated as separate bodies of the criminal offences - § 213 – Embezzlement - Any person who takes possession of property of another that has been entrusted to him, thus causing small damage to the property belonging to another, shall be liable to a term of imprisonment of up to two years; § 215 - Unlawful enjoyment of a thing of another - Any person who appropriates a thing of small value belonging to another with the intention to temporarily use it, or who, without authorization, temporarily uses a thing that has been entrusted to him and thus causes small damage to the property of another, shall be liable to a term of imprisonment of up to one year; § 221 – Fraud - Any person who enriches himself or other to the detriment of another person's property through misrepresentation of another person or through taking advantage of another person's mistake, and thus causes small damage to the property of another, shall be liable to a term of imprisonment of up to two years. [2]

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